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The Journal of
The Madras Geographical Association

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Settlements in the Lower Indus Basin (Sind)

Showing the Influences of Political, Climatic, Geomorphological, Tectonic and Hydrographical Changes in the Region

BY

PROF. MANECK B. PITHAWALLA, B.A., B.Sc., L.C.P., F.G.S.
Research Certificate, University of London.

I. INTRODUCTION : NEED OF A GEOGRAPHICAL SYNTHESIS OF SIND.

So far I have made a fairly full analysis of the principal geographical features of the lower Indus basin and dealt with such specific aspects of it as the physiography, climatic conditions, natural vegetation, etc.[1] The geographical control has thereby been sufficiently indicated. In the present monograph an attempt has been made to consider the human factor and to outline the human geography of Sind, especially in regard to settlement. In the chapter on "Historical Geography of Sind,"[2] I have already

1. Pithawalla M.B.—"A Geographical Analysis of the Lower Indus Basin (Sind)."
   Part I: Physiography.
   Part II: Natural Vegetation, Irrigation and Agriculture.
   Part III: Climatic Conditions.
   (*Proc: Aca. Ind. Sci.* Vol. IV No. 4 and Vol. VI No. 1 and *Jour. Univ. Bom.* Vol. V. Pt. 4).
2. Pithawalla M.B.—"Historical Geography."
   Part I. Outstanding Geographical Features.
   Part II. Pre-historic and Early Historic Periods.
   Part III. Later Historical Periods.
   (*Jour. Sind. Hist. Soc.* Vol. II Pt. 1, Vol. II Pt. 2 Vol. II Pt. 4 and Vol. III Pt. 2).

formed a connecting link between the geography and history of the province, as it is the purpose of all historical geography to discover the regional geography of the past. But it is now necessary to undertake a *geographical synthesis of Sind* in order to show how man has lived in the region.

Far from becoming a determinist, it is necessary for me to prove that man has struggled in this region to make the fullest use of its resources and, to some extent, modify the geographical environment in which he is placed. Particularly with regard to human settlement, the basin affords an excellent example of human endeavour to make history in evolutionary geographical conditions. Thus in studying the interaction of geography and history of Sind, the changing aspects are not to be ignored. In fact, it is in such a geographical setting as we have discovered that it is easy to see how human society has successfully functioned and evolved itself.

Settlement, in general, bears a close relationship to geological features, topographical and other conditions and also human power to modify environment. "Historical geography is essentially a study of environment and involves the reconstruction of the landscape at various periods of human development."[3] The story of Sind through many long centuries has been told in terms of its changing streams and river beds, changing lakes and blown sand, changing creeks and river mouths ; there is little of its surface now covered with sand and silt both in the desert and the valley areas, that has not been cut up by old channels of the Indus or the Hakra.

In the basin of the Indus was born the earliest civilisation in India ; nay, one of the earliest homes of mankind was established here. Since then, countless generations of people have come in and passed out of it into the mainland or gone abroad, utilising Sind as a halting place for some time. In it, there always has been the river Indus, flowing for hundreds of miles, and falling through thousands of feet, from the world's highest mountain into the depth of the Arabian Sea. The river itself has had a chequered career throughout geological and historical times. Carrying all the combined waters of the Punjab, it has brought for Sind rich silt and loose sand, and where there are no rocks or other impediments, it

3. Freeman T.W.—"The Early Settlement of Lamorgan." *Scot. Geog. Mag.* Vol. 52 No. 1 P. 12.

has preferred to wander from side to side.* So in its final stage particularly, the river, owing to many changes in its branches and mouths, has afforded no permanent settlements for man.

And yet this river has given shelter and life to numerous ancient tribes and influenced various forms of government to prosper or to perish. In its waters, again, have bathed religious people, and merchant ships, country craft, and vessels of war have also sailed; the ancient Vedic Aryans, Iranians, Sumerians, Greeks, Indians—all have sung songs of praise to the Deity, on the banks of this sacred river.

Frequent Changes.

But frequent changes have been the predominant characteristic even of the pre-historic geography of Sind. An antechamber for the whole of Hindustan, owing to the uncertainties pointed out, its earliest settlements were so unstable. Many Sindhi towns rose and fell with the floods or other natural phenomena, new ones were established in more convenient places or the old ones rose again on higher ground, after the floods had subsided; many more came into being on other banks or streams, near newer coastlines, with identical names at times to continue the tradition. The great river to-day has but two fixed points in its course of about 500 miles throughout Sind *viz.*, Bukkur (ancient Behker) and Kotri, neither of which, however, boasts of a large population even to-day. Though there was room for large and agglomerated settlements, natural forces did not allow them to continue long. With the advance of time, there came into existence large and flourishing towns, seaports, riverports, even manufacturing towns on newer fresh-water streams and lakes, and river channels, which were converted into irrigation canals, or highways. All these habitations have undergone changes of a far-reaching character with the result that Sind has a distribution of population, which shuffles and reshuffles itself and is also migratory in some parts.

The earliest penetration of human beings into the valley must have been by land through the mountain passes in the Western

*"The sediment brought down is very great, forming in a single year an island 65 square miles in area, and one yard deep. The delta projects little beyond the normal coastline owing to the distribution of silt along shore by the ocean current and to the deposits of the remainder in a vast submarine through 1,200 feet deep and upwards due south of the river mouths." (Reclus., *Asia*, III, 139).

Highlands in search of food, grass and water. They appear to have settled at first in the valleys of the Tertiary rocks in the Kohistan section especially the Baran, the Naing and the Bandhni valleys. Due to a possibly greater rainfall and the existence of hill torrents, and the presence in the neighbourhood of flint available in limestone outcrops, the early Stoneman established his first factories here. Advancing further, the Bronze man moved to the Manchar Lake and the Indus Valley (Western Nara) areas ; later on, due to the flood menace, historic man tried to settle down or build temples on mounds and raised ground in the valley, in island towns and near rocky projections. Later still, sea-faring races sought the delta and the coast land for trade. Agriculture, however, being the greatest industry in a region like Sind, succeeding generations of men sought the whole river valley, flood plains, canalised parts of the desert and so on.

The density of population in past ages was more on Old Alluvium, covering Chanduka and Larkana districts, as the soil was essentially loamy and rich, and the land, like a Doab, was drained by hill-torrents on one side and the Indus on the other. Along the banks of the Hakra, too, there were settlements but they are now covered over with sand.

The result of our enquiry into the historical correlation of Sind has also shown that there have been great fluctuations in the centres of Government and military power in the land. Sind's centre of political activity has shifted from the Western Valley Section to the Eastern Valley Section, then from the Northern area to the deltaic land, then again to the midlands and the Indus valley proper. Attacks from outside and ingresses into the province, through the convenient mountain passes and some of the mouths of the river, have been many and periodical. At the same time, the physical nature of the region and its divisions made it difficult for any central government to exist even over a portion of the land for a long time. One race after another came, settled at suitable places for the time being and then passed on, leaving its influence behind.

The nature of the coast being uninviting, there was practically no coastal population. If there were any important settlements in Sind, they were inland, in the then well-watered Kohistan valleys, along the banks of rivers, their branches and canals, on the trade-routes, even where they passed through the desert belt. A few towns were also established as out-posts of larger settlements, which commanded the cultivated fields on the frontier, in spite of the

severity of the climate in Upper Sind. Most of these settlements, however, were transitory.

Parts of the now desert land appear to have been so populated, though archaeological data in Sind are very scanty. There was a possibility of extensive population in this desert part of Sind as well as the neighbouring tracts of Cutch in the past. No doubt the sea also flowed where there are now sand-hills and salt deposits.

On this subject of great changes in the land, historians have also said enough for our corroboration :

" This saline plain (Rann of Cutch) was certainly at one time flooded by the sea, as shown by the abundance of salt and by the remains of vessels dug up near the neighbouring villages. Old harbour works are observed near Nagar Parkar. On the Eastern side of the Rann within historical times, it was probably the scene of an active sea-trade ; even in modern times the port of Mandavi on the southern coast of Cutch, carries a direct trade with Zanzibar, in small vessels averaging 50 tons, of less than 10 feet draught.

" The whole area was probably raised by some great earthquake. The upheaval is too regular to have occurred by ordinary causes. At the time of the Periplus, it seems to have been open water, although shoal, with a clear opening into the ocean below the Indus delta, and with a branch of the Indus running into it. Now the Indus delta is pushed very much further south and the scour of the tides has carried its alluvium along the coast, almost locking up the Rann ; while the branch that watered it no longer flows in that direction.

" One is led to surmise that the great migration from Cutch and Gujarat to Java which occurred in the sixth and seventh centuries and which led to the establishment of Buddhist kingdoms there (surviving in the tremendous temples of Boroboedor and Bramanan), may have been due even more to this cause than to the invasion of hostile Aryan tribes from the upper Indus. The conversion of a navigable bay into a salt desert and the diversion of the rivers that watered it, must have spelled ruin and starvation to multitudes of its agricultural and sea-faring inhabitants, who would have been forced to migrate on a scale unusual in history.

" Geological considerations tend to confirm the tradition, otherwise unsupported by historical evidence, that the Indus was formerly deflected by the Rohri Hills directly into the Rann of

Cutch, where it was joined by the river, which was supposed to have formed a continuation of the Sutlej and Sarasvati through the now dried-up Hakra (Wahind) canal. During exceptional floods the waters of the Indus still overflow into the eastern desert and even into the Rann. Other channels, traversing the desert farther south, still attest the incessant shifting of the main stream in its search for the most favourable seaward outlet. According to Burnes, a branch of the Indus known as the Purana or Ancient, still flowed in 1672 about 120 miles east of the present mouth. The constant shiftings of the river bed towards the east have rendered the eastern regions continually more arid and have changed many river channels into salt pits."[4]

Instability of the land: India's Changing Map.

It is to be noted that the Indus basin (Sind-Punjab) with its drainage is not the only part of India that is changing. "Changes in the course of rivers, coastlines altered by earthquakes, mountains in process of formation—such are the characteristics of India's changing map."[5] In fact every monsoon season means a change in the course of an alluvial river or deltaic land; every year the younger mountains of Extra-peninsular India are in the slow process of settling, upheaval or drift, with earthquake shocks felt now and then, or the older rocks of Peninsular India are denuded away by the subaerial agencies and the river deltas undergo changes. Whether in the valleys of the Brahmaputra, the Jamna or the Ganges, or in the valleys of the Punjab rivers, or even in the case of some of the rivers of the South, there are records or ruins of old settlements, which came into being and vanished.

The ports of Korkai and Kayal on the Tinnevelly coast, Puhar at the mouth of the Cauvery River, Tanda on the Pagla river in the Ganges Valley, the river port of Hijli on the Hughli, Pataliputra at the junction of the Sone and the Ganges, Jamalpur on the Brahmaputra,—all these are examples of hydrographical changes in India. Elaborate river-training works made by man, have now fortunately averted disasters in many parts of the country, *e.g.* those in connection with the Hardinge Bridge, the Sutlej railway bridges, etc. Bunds and other protective works are constructed on the up-

4. Schoff W.H.—"The Periplus of the Erythraean Sea."
Translated from the Greek and Annotated—New York 1912 pp. 173-174.
5. "Javelin"—"India's Changing Map." *Ills. Weekly of Ind.* March 29th 1936 pp. 18ff.

stream side and on both the banks for several miles to ensure safety of bridges, culverts, fields and farms during the monsoon or flood season. Otherwise the old history would repeat itself especially in modern Punjab, Bengal and Bihar.

Thus the problem of the location and identification of old sites in India is very difficult. The most significant is the example of the Indus and the Hakra-Wahinda river systems within the region of our study. Students of Indian history are familiar with the many attempts which have been made to trace India in the fourth Century B.C., but so great have been the changes in the river courses that most of these attempts are certainly wide of the mark and, at best, only a broad approximation is possible.

" Alexander's long river voyage to the sea, on leaving India is assumed by most historians to have been made on the Indus, but the map has altered enormously since those days and it is far more probable that he sailed down the famous lost river, the Hakra."[6]

Besides hydrographical changes there are evidences of other changes worth considering, e.g., climatic, tectonic, political, etc. Not only in the field of irrigation and agriculture but also in trade and commerce and even lines of pilgrimage, man has made his mark and left vestiges of his habitations and activities throughout the historic periods.

Changing Aspects of Sind

Thus by combining the factors of 1. Relief and drainage, 2. Climate, natural vegetation and animal life, 3. Irrigation and agriculture. 4. Geomorphology, and 5. Hydrography, it is possible to prepare a map of Sind settlements for all times. The task of identifying several old towns in Sind is particularly difficult, as few historians or geographers agree on any principle of identification and their opinions are conjectural, confusing or contradictory, e.g. Raverty and Elliot.[7] Unfortunately, the best aid of archaeology in the identification of old sites is greatly lacking, the discovery of Mohenjo Daro itself, being accidental, and of Majumdar's excellent Sind survey[8] full advantage has not yet been taken in further

6. *Ibid* P. 71.

7. Raverty Maj-Gen.—"Mihran of Sind and its Tributaries" *Jour. Asia. Soc. Beng.* Vol. LX 1893. Elliot and Dowson—"The History of India" Vol. 1, 1867.

8. Majumdar N.G. "Explorations in Sind" *Mem. Arch. Sur. Ind.* No. 48, 1934.

systematic excavations. Cunningham and Cousens did their best in their time, and recently Dr. Mackay's excavations in the Nawabshah districts have been greatly valued. However, we hope to arrive at some definite conclusions as regards the physical changes and the location of prehistoric and historic sites by producing both the physiographical and historical evidences side by side.

Comparison of Old and New Population Maps

A comparison of a historical map of Sind with a modern survey map showing the density of population by towns and villages according to the latest Census Report (1931) will enable us also to prove our thesis of Sind's changing aspects and the possibility of a more or less settled population after the completion of the Sukkur Barrage irrigation project within the Indus Valley. (See Pp. 334 and 335, Map attached and also my "*Sind's Changing Map*".)

Attractions for immigration into Sind

A large proportion of the population in the past must have been attracted to the Indus Valley for the following reasons:

1. *Evolution of steppe-nomadic life on the dry Iran plateau.*

So much and so varied were the onslaughts on the valley from tribal chiefs and aspiring conquerors, and from dry plateau lands that it is not difficult to say that among the earliest immigrants into Sind were the Iranians and those nurtured in Iranian culture, on Central Asiatic plateau, which is supposed to be the Aryan home. In the growth and evolution of steppe-nomadic life[9] there was the thirst for conquest of settled countries like the Indus basin.

2. *Fertility of the soil.* The soil being extraordinarily rich, people sought the best parts of Sind for settlements within the valley, in spite of the dangers of floods etc. It was the drift soil from the mountains of Extra-peninsular area, and hence productive in the extreme.

3. *The Indus.* The river was another great attraction for the people not only for a plentiful water supply in the otherwise dry basin but also as a water-way, as a fishery depot and as a unique fertiliser of soil with silt, brought along with the floods. The earliest canals were inundation canals off the Indus.

9. Lattimore Owen—"The Geographical Factor in Mongol History", *Jour. Geog.*, Jan. 1938. Pp. 8, 11, 12.

4. *The crops* were double, Kharif (Summer) and Rabi (Winter), a regular alternation of harvests throughout the year.

5. *Passion for conquest.* Every conquering tribe or race brought in a number of immigrants to settle down, though after a time they moved on to the upper Indus basin or to the Ganges basin and beyond. To some, Sind was a geographical necessity for further conquests e.g. Arab and British.

6. *The deltaic ports.* Though the Indus delta was not very attractive and there were no great and permanent harbours in it, owing to a very prosperous hinterland, there were ports like Patala, Debal, Lahri Bandar, Ghora bari and others, which carried on trade with other fertile and prosperous valleys, such as Mesopotamia.

7. *Ultimate exodus into the neighbouring provinces.* Lastly, Sind was distinctly a stepping stone to Hindustan for natives as well as foreigners.

II. ELIMINATION OF THE POLITICAL FACTOR.

In my survey of the historical geography of Sind,[10] I have noticed that the political factor has to some extent contributed to the changes in human settlements in the region, though at the same time, political onslaughts, invasions and raids on Sind were themselves due, not only to the growing struggle for food and water in the neighbouring highlands and tablelands, but also to religious differences, and lust of conquest and trade. Among the earliest historical establishments of military posts were Patala at the head of the then delta, and the two ports on the eastern and western mouths of the river, established by the Greek conqueror. In the days of the Hindu Kings of Sind like Chach, Alor formed the proper centre of government for Greater Sind, over which they extended their power even as far as Kashmir in the north, before the Arabs took over from them. The Sumras still inhabited parts of the eastern desert land and the Hakra valley under cover, by reason of their inaccessibility at the same time as the main Indus valley was occupied by the Arab conquerors. But when the enemy forces were withdrawn, they tried to re-occupy the delta country lower down e.g. Samui (Tatta).

While the Arabs themselves were in power, they chose Mansura near the ruins of old Bahmanabad, as their capital, the Rajput

10. "Historical Geography of Sind" Part II and III *Op. cit.*

rulers who were driven out into the desert in the east had to choose Mahomed Tur as their outpost, the Daupotras fixed Shikarpur on the highway to Iran as their centre of government in preference to the earlier choices of Bakkar or Nasrpur, and when Sind fell into the hands of the Delhi emperors, they made Bakkar Island, again, their governor's residence in preference to Tatta in lower Sind. When Nadirshah invaded Sind, Shikarpur on the highway fell naturally into his hand and, it became a great trading centre between Afghanistan and Sind. The Kalhoras, who claimed affinity to a race of mendicants in the Chandukah district and who were builders of such big canal systems as the Ghar, concentrated their forces on the right bank of the Indus and even fixed Khudabad as their principal town. The damming of the Puran river with the purpose of turning a portion of Kutch into a desert by Mian Ghulam Shah is another glowing instance of the political forces working in the land. The Talpurs, before they succeeded the Kalhoras, were also forced to establish a few outposts in the Pat Section e.g. Islamgarh. It was a *political necessity* for the British to occupy the channel of the river Indus and to exchange the fertile parts of Northern Sind for portions of the sandy desert with the Mirs of Khairpur State. The British themselves, with their maritime power, chose the port of Karachi for their headquarters in preference to Hyderabad, after the whole of Sind was conquered by them.

Lastly, there were several temporary outposts created by the native rulers in out-of-the-way places in the Thar and Pat Sections. With them the native population moved and established settlements, which are now no longer in existence.

III. THE PHYSICAL FACTOR.

The physical factor however is more powerful than the political and we shall now consider it in all its bearings on Sind settlements.

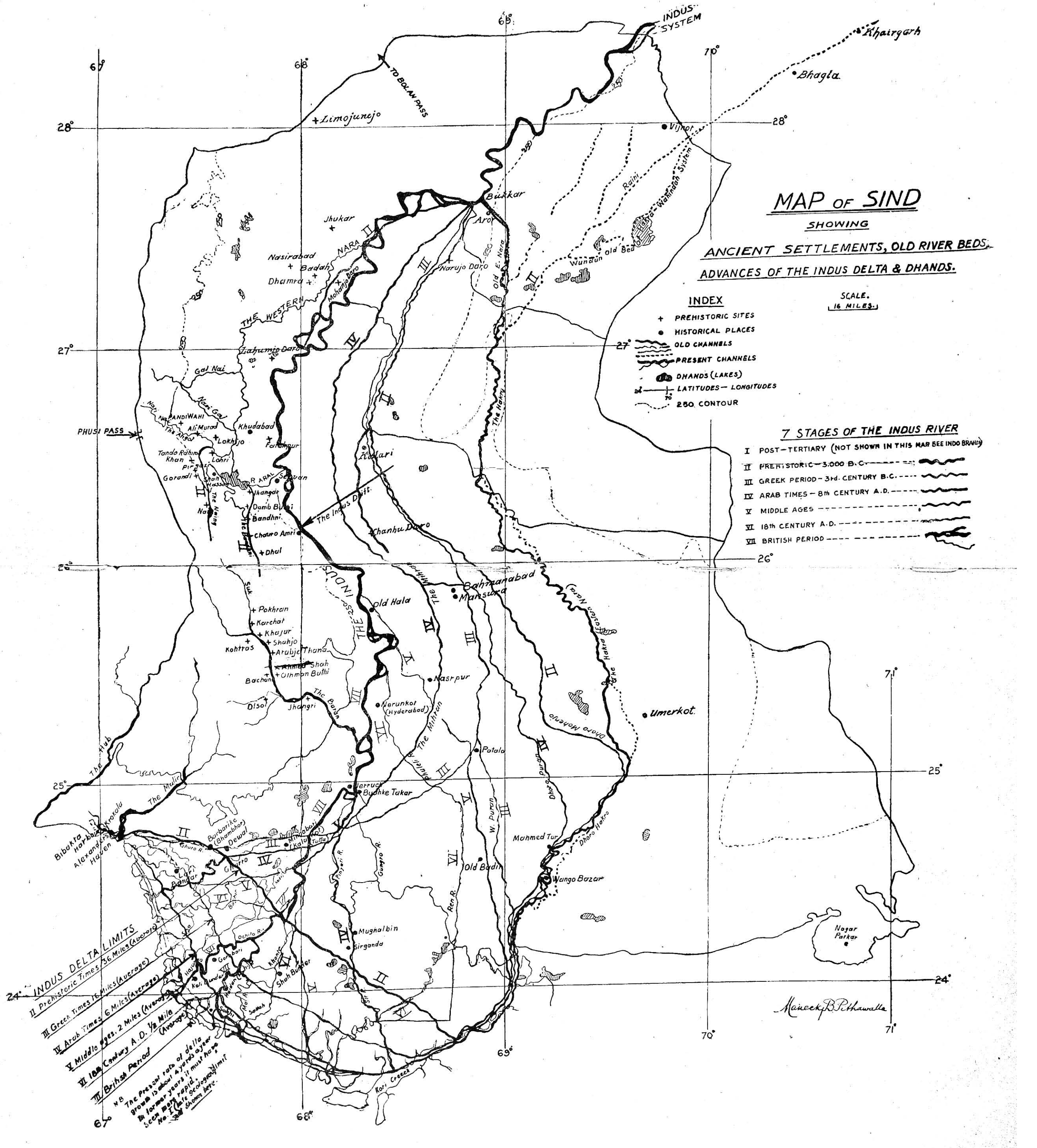
1. *Climatic Variation.* Let us first of all consider the question of climatic change in this region. The greatest exponent of this is Ellsworth Huntington, whose theory of pulsatory climatic changes for many thousands of years, has been criticised, e.g. the period of 3,000 B.C. to 1,400 A.D., as the curve drawn by him shows, is indicative of numerous pulses. He tries to find everywhere " abundant indications of a change in climate," and " densely populated, higher civilisation," in the ruins now buried under sand or lying barren on the dried up shores of lakes or banks of rivers. He regards

climate as closely connected with civilisation and asserts that "a favourable climate is an essential condition of high civilisation."[11]

A study of Central Asia, Turkestan, Palestine and Ladakh shows that there were some fluctuations in the wetness and dryness of these areas at various times, with the result that hordes of nomads left their barren homes for better and more congenial ones from time to time, both in the east and in the west. But British geographers are loath to accept the theory of climatic change and give other causes of destruction of grasslands, agriculture and settlement, in steppe-nomadic life, such as, the practice of agriculture on too thin a soil, too much rain washing away the soil, exposed by ploughing or too little rain causing wind-swept dry soil. Over-gazing and prolonged war would also destroy good cultivated lands. At the same time they are ready to acknowledge that "Climatic variation might add impetus and emphasis to either dispersal or concentration."[12] So far as Sind is concerned, it is not possible to obtain any clear evidence to prove such *great fluctuations* in climate.[13] On the contrary, from the few archaeological remains which have already been dug up, we can surmise that the high summer heat, for which Sind is known, has not appreciably diminished, since the days of Mohenja Daro. The best example is that of the baths, especially the central public bath, which must have *been utilised by common people more than the well-to-do.* The sculptures of Indians made by Darius at Hamadan show them naked or with very scanty garments, typical of hot and arid climate.[14]

Alongside this, can be placed the argument advanced by C. F. Oldham and others that, had the rainfall of the Punjab and Sind been greater at the time of the settlement of the Vedic Aryans on the Sarasvati, in Aryavarta, about 1500 B.C., the land would have become very marshy and uninhabitable. Sanskrit hymns were even composed by them in connection with rainless days and droughts. More rain on the Siwaliks (Lower Himalays) would have meant more waters in the Ambala streams and greater and more disastrous floods in Sind. At the same time, archaeological evidence is in favour of ascribing a climate with somewhat greater rainfall to this prehistoric period in Sind.[15] It is possible that Sind experi-

11. Huntington Ellsworth— "The Pulse of Asia."
12. Lattimore Owen—*op. cit.* Pp. 4 and 15.
14. "Historical Geography of Sind" Pt. 2, *op. cit.* Pp. 31-32.
13. Proc. Ind. Aca. Sci. B. Vol. 6, No. 1. *op. cit.* Pp. 29-30.
15. "Climatic Conditions in Sind" *op. cit.* Pp. 29-30.



MAP OF SIND
SHOWING
ANCIENT SETTLEMENTS, OLD RIVER BEDS, ADVANCES OF THE INDUS DELTA & DHANDS.
INDEX
+ PREHISTORIC SITES
• HISTORICAL PLACES
OLD CHANNELS
PRESENT CHANNELS
DHANDS (LAKES)
LATITUDES — LONGITUDES
250 CONTOUR
SCALE. 16 MILES.
7 STAGES OF THE INDUS RIVER
I POST-TERTIARY (NOT SHOWN IN THIS MAP SEE INDO BRAHUI)
II PREHISTORIC - 3,000 B.C.
III GREEK PERIOD - 3rd. CENTURY B.C.
IV ARAB TIMES - 8th CENTURY A.D.
V MIDDLE AGES
VI 18th CENTURY A.D.
VII BRITISH PERIOD
INDUS DELTA LIMITS
II Prehistoric Times 36 Miles (Average)
III Greek Times 16 Miles (Average)
IV Arab Times 6 Miles (Average)
V Middle Ages 2 Miles (Average)
VI 18th Century A.D. ½ Mile (Average)
VII British Period
N.B. The present rate of delta growth is about 4 yards a year. In former years it must have been more rapid.
INDUS SYSTEM
TO BOLAN PASS
PHUSI PASS
Khairgarh
Bhagla
Limojunejo
Vijnot
Bukkar
Aror
Jhukar
Nasirabad
Badah
Dhamra
THE WESTERN NARA
Mohenjo Daro
Narujo Daro
Old E. Nara
Raini
Wahindah System
Lohumjo Daro
Gaj Nai
Nari Gaj
Khudabad
Ali Murad
Lakhijo
Tando Rahim Khan
Lohri
Pir Gazi
Gorandi
Shah Hassan
R. ARAL
Sehwan
Jhangar
Damb Buthi
Bandhni
Chauro Amri
Dhul
Kudari
The Indus Drift
Chanhu Daro
The Hakro
Bahmanabad
Mansura
Old Hala
Pokhran
Karchat
Khajur
Shahjo
Kohtras
Arabjo Thana
Ahmed Shah
Othman Buthi
Bachani
Nasrpur
Dhoro Mohenjo
Umerkot
Dhoro Puran
Dhoro Hakro
The Baran
Jhangri
Nerunkot (Hyderabad)
The Mithran
Patala
The Hub
The Malir
Jerruck
Budhke Takar
W. Puran
Bibakra
Harbaba
Krokala
Alexander's Haven
Banbhore
Dewal
Kalakot
Tatta
Ghara
Old Badin
Mahmed Tur
Wango Bazar
Rori R.
Gungro R.
Mughalbin
Sirganda
Shah Bunder
Khobar
Bandar
Ochito R.
Keti Bunder
Kori Creek
Nagar Parkar
THE INDUS
28°
27°
26°
25°
24°
67°
68°
69°
70°
71°
Maneck B. Pithawalla

enced a better climate in the days of Mohenjo Daro and Chanhu Daro, the best proof being the chain of prehistoric sites, discovered by Majumdar within a definite zone, parallel to the Khirthar mountains in the Kohistan region, e.g. Wahi, Ali Morad Shah Hasan, Pokhran, Karchet, Khojur, Shahjo, etc.[16] There must have been more powerful hill torrents and sufficient water supply to enable such a large number of settlements to flourish in this dry part of Sind, before people moved on to lower levels in the Valley. "The stations of prehistoric culture, discovered in this region, were very closely situated to one another, forming a chain, as it were, running parallel to the Khirthar Range. At none of the sites again has been traced any sign of re-occupation after the Chalcolithic times, and at present no permanent human settlement exists in the neighbourhood of many. Judging from the large number of stations existing in such a narrow compass, this part of the country must have been much more densely populated than it is now. To the west of the Khirthar and the River Hab, in the Jhalawan and Makran Districts of Baluchistan, Sir Aurel Stein has discovered a similar chain of prehistoric Sites, and at some of these he has been able to detect clear evidence of dessication. (Mem. *Arch. Sur. Ind.* No. 43, pp. 34, 132, 186.).

Putting these facts together, it seems plausible that one of the reasons for the desertion of the sites in Western Sind was the appearance of a drier climate. And due to this circumstance or another, "the people gradually moved towards the rich food-producing lands of the alluvial Indus Country."[17] The Manchar Lake itself must have been broader and vaster on this very account. One evidence given by Majumdar is the number and type of pile dwellings along its shore, harbouring a fishing race.

Particularly in these prehistoric times, the people were afraid of settling on the banks of the Indus, it being more violent in its floods than other rivers and so they must have selected these sites of the Manchar Lake and the higher levels of Kohistan, which are now so dry and covered with sand that there is very little greenery or any other attraction for settlement. Thus at least a variation in climate is possible in the region, some 5,000 years ago. In more recent years, the climate may have become drier and less cold for other reasons such as the shifting of the high-pressure (monsoon) belt.

16. Majumdar *op. cit.* P. 145.
17. *Ibid* P. 147.
Sir Aurel Stein, *Early Relations between India and Iran*, P. 14.

With the growing mass of sand hills in parts of the valley, there is a gradual rise in the ground level and hence a drop in the water table, which within the Thar desert is considerable, *viz.*, 500 ft. below the surface. Not only sand but also salt in large quantity is blown in from the Rann of Cutch and desiccation is accentuated thereby.[18] There is no surface or subsoil evaporation at all here. The high range of temperature in summer, the action of wind currents and rain water in flood times on soft Tertiary formations, cause a considerable disintegration of rocks and accumulation of sand, thus helping the process of desiccation.

With this there is the evidence of receding glaciers in the Himalayan region. At least two of the rivers in the Indus system —the chief sources of water in the valley,—are snow-fed. Much depends, therefore, on the periodic diminution or augmentation of glaciers in the mountains. At present, a shrinkage of Himalayan snow-fields is noticeable.[19] Thus there appears to be a distinct variation, if not a change, in the climatic conditions of the Indus Valley.

2. *Geomorphology.* More important are the changes made in the human geography of Sind by other natural changes :—

(i) *Valley Form.* That the Indus in its lower reaches is an aggrading river has been already shown.[20] The form of the valley, therefore, is unique in the lower basin. The river bed is now on a ridge, higher than the surrounding country, aggradation being heavy and the process of silting continuous. Old alluvium (Bhangar) is found on the right bank largely covering Larkana and Upper Sind Frontier districts. The rest of the province is covered over with new alluvium (Khadar) after periodical and heavy floods.

An examination of the deposits in the Khadeji river valleys shows that there must have been Pleistocene river deposits in Sind. Fresh-water shells are found in them, covering the valley, and the present bed of this river is narrow and cut within these fluviatile deposits, showing thereby the past physical conditions different from the present ones. Many features of Sind's prehistoric geography are exposed in such dry river valleys.

18. Pithawalla M.B. "Marvels of the Earth" 1927, P. 147.
19. Younghusband Sir Francis—
Jour. *Roy. Geog. Soc.* Aug. 1932, P. 141.
20. *Proc. Ind. Aca. Sci.* B. Vol* IV No. 4 P. 324.

In many parts of Kohistan, subaerial agencies have cut down valleys in fractured anticlinal folds. This process is still continuous and the work of denudation and transportation of material is completed by winds blowing from opposite directions in the hot and the cold seasons. These low flat-topped hills and broad elongated valleys are the characteristic features of Sindhi landscape. Where there are surface springs, hot or cold, in such a region, there are chances of settlement, however transitory.

(ii) *Subsidence and Upheaval.* There are no signs of subsidence in Sind, in recent times. The submergence of the Indus gorge, off the present coast line, has been noted. It was indeed a unique subsidence: "On the west side, opposite the present mouths of the Indus river, lies the Indus 'Swatch' that cuts through the edge of Continental Shelf, commencing at a depth of about 30 metres and at its mouth reaching a depth of about 1,134 metres on each side of which the walls of the gulley rise up to a depth of only 200 metres".[21] The drop in the level below Allah Bund after the Cutch earthquake of 1819 was also remarkable. A very wide area was affected by it. But, on the other hand, there are distinct signs of gradual upheaval of the land, e.g. The Oyster rocks off Keamari, the coral beds at Mangho Peer, and the salt lakes (Dhands) in the desert section. That the sea has gradually receded can also be easily seen on the shore at Clifton. Thus the land is generally rising and there are more chances of drying up of springs and desertion of settlements thereby than by submergence in such quarters.

(iii) *Aeolean Deposits.* The whole of the Desert province is covered over with sand-hills, which change their direction and size in different seasons. Burial of human habitations underneath these hills is certain.

(iv) *Delta Growth.* There are clear signs of the Indus delta advancing *viz.*, increasing foreshore, changes in the mouths of the river in the inlets of the sea and in the river ports, growth of the mangrove swamps and accumulation of sand-hills for many miles. Debal, Lari Bandar, Shah Bandar, Gora Bari, Keti Bandar, and Sukhi Bandar, thrown inland one after another, are evidences of the delta growth of the Indus. According to Haig, the present rate

21. Seymour Sewell, R.B.—"The Oceans round India." *Ind. Sci. Cong. Assn.* Nov. 1937 P. 26.

of growth is about 4 yards, a year on an average. The rate of growth in earlier ages must have been greater, e.g., 20 yards about 5,000 years ago, when Mohenjo Daro flourished.

(v) *Rock Disintegration.* The subaerial agencies are at the same time, constantly at work on the rocks in the hilly parts of Sind. Here soil erosion is very great and surface run-off too rapid for any soil resistance. Long periods of time without rain are followed by torrential downpours. The effects of solar heat and wind currents are greater than that of rain water. Wherever there are chances, surface springs, which are perennial, appear in rock ravines, indicating sub-artesian conditions due to accumulation of detritus at lower levels and faulting and fissuring of the numerous anticlinal folds. Nearby, there is sufficient grass for sheep and goats to thrive for a time.

(vi) *Effects of Floods.* Floods are a most dreadful menace to human habitations in Sind ever since the age of Mohenjo Daro. They are caused by the agencies of thunderstorms and the Indus inundations. They are periodic and thereby settlements are greatly disturbed. The chief cause of the frequent evacuation of Mohenjo Daro was the inundations of the Indus. The number of other Daroes or towns established on mounds in Sind are also a direct evidence of the terrors of floods.

3. *Tectonic Changes.* Sind falls within the danger zone of North-West India, and a large part of western Sind actually lies within the range of severe earthquakes, recorded since 1850. e.g. Quetta 1905, 1935.[22] The younger Tertiary rocks of the Khirthar range are still in the process of settling and now and then a shock is felt, and upheaval or subsidence takes place here and there in the zone. The growing Indus delta also may have something to do with the occurrence of earthquakes here. However, it is the considered opinion of geologists like R.D. Oldham that earthquakes do not cause changes of level on a wide scale. Any such change is usually too local, though the damage may be severe. "Slow changes, unnoted at the time and unaccompanied by sensible disturbances are much more effective."[23] Regarding the tradition of the Alor earthquake of 962 A.D., Oldham writes: "I do not recollect anything of the earthquake which you mention but *very much question its having made any great change in the main*

22. West W.D. "Earthquakes in India."
Proc. Ind. Sci. Cong. 1937, Pp. 189 ff.

23. Oldman R.D.—Letter to the author dated 27-3-1933. Llandindrod Wells.

course of the Indus." In his opinion, the tradition seems to be a recollection of events, which really happened or an off-spring of some attempt at a theoretical explanation of a striking peculiarity.

No systematic records of earthquakes before 1850 have been kept, but it is likely that the land, being within the danger zone, has suffered from disturbances, and tectonic changes, though localised, have taken place in the past. Bahmanabad is known to have been destroyed by an earthquake from the discovery of the ruins before the establishment of Mansura, by the Arab conquerors in the 8th century.[24] Other earthquakes in Sind were not so severe, but fissures and geyser-like holes in the Badin and Moghulbin Taluka were prominently marked in 1903. In 1905 a seaquake caused a layer of dead fish off the coast at Clifton. A tidal wave was recorded near the town of Sindree in the Rann of Cutch in 1903.[25] Mysterious sounds are sometimes heard by natives in the hills near the hot springs of Laki and other places in the hill range and occasionally shocks are felt even at Karachi. But as we stated above, the effects are localised and not so severe or far-reaching as those of hydrography in the Indus basin, which I shall deal with presently.

Although there is a large number of hot springs found in Sind, it is not possible to trace them to any active vulcanism.

4. *Hydrographical Changes.* (i) *Unstable water-table.*—Sind is notorious for its meagre and highly variable rainfall. While there are peaks in the rainfall curves of great floods, there are many years of droughts and the water-table falls considerably low. On the other hand, in certain restricted areas of sand belts, there is actual water logging and lakes are formed, so that not only does agriculture suffer but actual villages are destroyed. In the dried parts of Sind, where the water level falls as low as 400 to 500 feet, there are hardly any stationary villages in existence.

The hydro-isobaths within the Barrage area show varying depths (3 feet to 30 feet) not only in different parts but also in different seasons and in different years, the concentration being only possible along the river bed or the canals. Outside the Barrage area, the water-table fluctuates much more.

24. Cousens "Antiquities of Sind."
25. Proc. Ind. Aca. Sci. B. Vol. V, No. 4, *op. cit.* P. 285.

(ii) *Unstable Hill Torrents and Springs.* In Kohistan, there are perennial springs on high ground, suggesting artesian conditions. Some of these are hot-water springs, which attract religious people who have built temples and mosques near them. At times it is difficult to say who first established these temples, Hindus or Mahomedans e.g. Mangho Peer and Laki. These springs are divided into (a) perennial and (b) seasonal. Prominent among the former, are the Angai, the Naing and the Bandhni in the Johi and Sehwan Talukas. These spring-fed channels form some of the beauty spots in Sind, like oases in a rocky desert and they are taken advantage of by the natives even in their crude ways. e.g., " Just above the village (Naig) the stream descends into a cascade which is harnessed by a water wheel for grinding floor and other cereals."[26]

Other hill-torrents are seasonal and in full swing during the rains only. Some of them are the Khenji, the Nari, the Gaj, the Makhi, the Salari, the Buri and the Baran. Though they flow for a limited period of time, their force is very great and the discharge plentiful. Many of the surface streams in Kohistan are thus dry for the greater part of the year, but within their valleys there are deep-seated springs which supply water to some of the larger settlements, of the malir.

(iii) *Unstable Lakes.* While there is such a great diversity in the depth of underground water supply, and even in such a dry region there are lakes, which are of two kinds : (1) Fresh water lakes, (2) Dhands or salt water lakes. Many of these do not exist to-day, but there is no doubt that on the shores of these there were settlements in the past[27] and even to-day, beside the numerous Dhands in the Thar-Pat Section, there are villages in which the chief occupation of people is collection of salts from the salt lakes.

To-day the only large fresh-water lake in existence is the unique lake of Manchar—regulating the drainage of the right Indus bank. This must have been a wider lake, as is proved by the presence of the Aral river, now having a duplicate character, *viz.*, flowing into the Manchar Lake in the flood season and into the Indus river in the opposite direction in the off-season. Other lakes there must

26. Majumdar *op. cit.* P. 88.
27. *Ibid* Pp. 53-78.

have been in the valley, but they are no more in existence and they cannot be located anywhere in Sind, e.g. the lake, crossed by Alexander while going over to the western branch of the Indus, which was "of great extent and received its supply from other waters in the neighbourhood."[28]

Again some lakes mentioned in the Chach Namah, such as lake Gujari and lake Sangrah, deltaic lakes of Arab and Sumra days, are no more in existence ; so also the lakes, such as that near old Hala, have disappeared through sedimentation, as all ox-bow lakes ultimately must.

(iv) *Unstable Rivers.* But hydrographical changes in surface streams and rivers are the chief causes of the unsettled population in the province. Sind is notable for fluctuations in river courses, forming and silting up of their branches, formation and drying up of deltaic lakes and consequent changes in human settlements.

The main river systems in the region of our study are :

(A) *The Hakra—Wahinda System* (Modern Eastern Nara).

(B) *The Indus System.*

Both these rivers, especially the latter, have left marks in old courses or channels, *viz.,* Dhoroes or deep depressions, 6 feet to 12 feet deep and from 50 feet to 100 feet broad with which the valley is spread over, e.g., neighbourhood of Nasrpur. The dry channels are converted in some places by man into canals.

That there were these two distinct river systems existing in Sind in the past is recognised by some British geographers. After the Arab conquest, they were together called "the Mihran of Sind".[29] Human settlements followed these rivers and every change in them caused disturbances in village life, water supply, and transit facilities.

(A) *The Hakra—Wahinda System.* As regards this system, which is now largely dried up and of which the lower part is now converted in the Eastern Nara canal, there are many theories advanced by various authorities. The conclusions drawn by them are confusing, some of them having depended upon unreliable his-

28. Vincent W. "The Voyage of Nearchus." London 1797, P. 154.
29. Arden Wood W.H.—"Rivers and Man in the Indus—Ganges Alluvial Plain" *Scot. Geog. Mag.* Vol. 40, 1924.

torical records or traditional tales from Iranian and Arabic sources. The archaeological department has done little in the way of extensive search or exploration of those long chains of ruins along its banks which, if dug out properly, would throw much precious light on the ancient history of Sind and the Punjab.

The hydraulic data, which would be derived from so valuable an inquiry of this nature, are not available except those for the Barrage area, obtained by the Development and Research Division of the P.W.D. But there is no doubt that it is a stream, with a well-cut bed in the alluvium and *without* a large delta, which such an extensive river is expected to form. Beyond the latitude of Sukkur, it had little silt to deposit in the valley. How this river system has dried up, is worth investigating here. A synopsis of the research, done already on this interesting problem of the Hakra is given on Pp. 344-346.

Criticisms of the above. There is no doubt, and Oldham is our authority on the point, that before the formation of *Khadar* alluvium in recent geological times, the Jamna flowed westwards through some channel such as the Budhi Jamna (Old Jamna) or the western Jamna canal, and fed the Hakra or Wahinda to a certain extent. From this source a large volume of water was made available for the whole of the now desert tract, north and south.

During the Vedic times, however, the Jamna and the Ganges were praised in songs together. The Sarasvati, one of the Ambala streams, being fed by hill-torrents, then predominated. How the course of the Jamna was diverted eastwards, it is impossible to say with correctness. It may be due to the silting up of the channel, or to river capture, such as that by the Chambal, as suggested by Whitehead, in recent geological times. Some sort of river piracy by the Ganges or even self-piracy is also suspected.

At the same time, it would be incorrect to say that the *present Jamna* contributed to the waters of the Hakra, because the change took place in *geological* times, while the name Hakra is a recent one. Mr. R. D. Oldham writes: (Letter dated 1-3-1933: Llandindrod Wells): "Your difficulty is a natural one, but in saying that it seemed very impossible for the Jamna to have contributed any part of the waters of the Hakra, I was referring to the river of later times which was known by that name. The earliest record of this was in the 8th Century, if I recollect aright, and it is not likely that there was any natural overflow of water from the Jamna so late as that. At an earlier date when the Jamna did flow westwards, it probably

SUMMARY OF RESEARCH ON HYDROGRAPHICAL CHANGES IN THE PUNJAB AND SIND.

	Date of Research	Author	Method of Research	Results and theories put forth.
1	1871	Major General A. Cunningham, Director, Archaeological Survey of India in the "Ancient Geography of India"—Calcutta.	Archaeological	The Raini, Sotra, Chitrong were different from the Sutlej and met the Indus above Aror. The Eastern Nara—old bed of the Indus. Bifurcation near Jakrao into (1) the Purana flowing S.W past Hermetelia, Brahmnabad, past Patala (Haiderabad ?), and then turning S.E. into the Guni once more to meet the main stream, (2) The S.E. stream flowing past Amarkot and meeting the other branch in the south near Wanga Bazaar. The combined stream then passed through the Rann of *Kutch* into the Kori mouth.
2	1874	Sur. Gen. C. F. Oldham in the "Calcutta Review" Vol. LIX. "The Sarasvati and the lost River of the Indian Desert." J.R.A.S. 1893.	Historical	The Sutlej flowed into the Hakra, till the time it met the Beas westwards, owing to silting up of its bed. The Hakra and the Eastern Nara continuous, called Hakra Dhora, flowing independently till 13th century A.D. through the Sind desert into the Rann of Cutch. The Indus has flowed westwards near Sehwan at least since *the 8th* Century A.D.
3	1875	"Nearchus" in the "Calcutta Review," Vol. LX.	Historical and Physiographical.	The Sutlej did not flow into the Hakra but westwards into the Indus near Rohri. The Jamna flowing westwards might have fed the Hakra. Marut Bredha, a *mythical river,* was the "Lost River."

4	1886	R. D. Oldham Director, Geological Survey of India in the "Journal of the Asiatic Society of Bengal" Vol. LV Pt. 2 No. 4.	Geological, Physiographical and Historico-Geographical.	Supported C. F. Oldham's views. The Indus never flowed into the E. Nara (Hakra), but has kept westwards. The Hakra an independent river, though fed sometimes by the Sutlej positively and also the Jamna probably in recent geological times. Only the flood waters of the Indus flowed into E. Nara.
5	1892	Major H. G. Raverty in the "Journal of the Asiatic Society of Bengal", Vol. LXI, Pt. 1, No. 3.	Historical and Traditional.	Two different river systems meeting together above Aror into the Mihran of Sind. (1) The Indus and its *four* tributaries (without the Sutlej). (2) The Sutlej—Hakra System. Five transition stages are shown after the Arab period. The Sutlej westered to meet the Beas. The Indus ultimately grew at the expense of the Hakra. The Mihran at first flowed past Aror and through E. Nara.
6	1904	Col. Minchin and J. W. Barns in the Punjab State Gazetteer, Bahawalpur State Vol. XXXVI-A.	Physiographical	The physiography of the Bahawalpur State suggests that the Jamna may have fed the Hakra through the Ghaggar. The Hakra bed was too narrow to carry the Sutlej waters. The Indus and the Punjab have westered.
7	1924	W.H. Arden Wood C.I.E. in the "Scottish Geographical Magazine," Vol. XL.	Geographical.	Westering tendency of the Punjab rivers. The Sutlej a tributary of the Hakra and E. Nara. The Jamna may have fed them too. He also suggests a climatic change.

	Date of Research	Author	Method of Research	Results and theories put forth.
8	1929	Henry Cousens, Supt. Archaeological Survey of India in "Antiquities of Sind."	Archaeological.	Differs slightly from Raverty. The Mihran flowed into the Hakra below the Punjab confluence. The Hakra had two branches (1) the Western, which, when it left Alor, flowed into the Mihran, (2) the Eastern Nara. The Mihran an important unfordable river between Alor hills and the present Indus in Arab times. The Western branch of the Hakra left Alor after the Arab conquest and still later cut through Sukkur hill, in 1758, an important Indus change.
9	1929	M.R.I. Khan (Ph. D. London) Thesis in *MSS.*	Historical (Persian and Arabic.).	The Hakra a tributary of the Indus, *not* the Sutlej nor the Jamna. The Eastern Nara, an old bed of the Indus. The united waters of the Indus and the Hakra=Mihran. The Hakra dried up about the middle of 13th Century A.D.
10	1932	R.B. Whitehead, I.C.S. (Retd.), "Indian Antiquary," Vol. LXI.	Hydraulic data study.	Rivers like the Sutlej could not oscillate for 70-80 miles; Rivers governed by levels. The Jamna may have flowed eastwards. Possibility of reduction of rainfall etc, as a cause.

followed much the same course as that of the Hakra in later times, much the same in fact as that suggested by Whitehead's map, but in those times of which there is no historical record, the name of Hakra is not likely to have been in existence." This then, settles satisfactorily a part of our problem.

The next question is as regards the Sutlej. The Ambala streams are a logical continuation of the Hakra, as a number of ruins along the whole line show. But whether the Sutlej itself flowed into the Hakra or not is a matter of great doubt. Classical writers have mentioned only four Punjab rivers as tributaries of the Indus. The Sutlej has not been separately so named.

Mr. Whitehead has endeavoured to prove from hydraulic data that the Sutlej would *not* have swung through such a long distance as 60-70 miles and flowed into the Hakra till recently. But Raverty and Vincent Smith showed that there was no difficulty in the way of the Sutlej having once followed an independent course into the Hakra.

Col. Minchin and Mr. Barns suggested the same view. But the map drawn by them shows that there were chances of an overflow of *flood waters* from the Beas-Sutlej into the Hakra across the plains e.g. in 1871.[30] This situation must have been more favourable, when the Sutlej flowed further south. In the alluvial tract of the Bahawalpur State there are numerous deep depressions, showing signs of deserted river beds and therefore of a connecting link between the Punjab and Sind. Some of the Ambala streams, those towards the north, even now flow from the Siwaliks, close to the Sutlej gorge. During the flood season and the years of maximum snow-fall, these Ambala streams, above Sirsa and Bhatnir, must have come into contact with the Sutlej flow. Besides, the hydraulic data of recent years obtained by Mr. Nicholson in the Punjab, must have been much affected by silt and sand in recent times. There is, again, no doubt that some of the Punjab rivers *viz.* the Upper Indus, the Jhelum and the Chenab have westered.[31]

We may, therefore, naturally expect at least a portion of the Hakra waters to have been derived from the floods of the Sutlej, when it flowed further south. When, therefore, all the rivers

30. Pithawalla M.B. "Sind's Changing Map." 1938. Sheet 7 Map 42.
Punjab—State Gazetteers: Bahwalpur State, Vol. XXXVI-A. Lahore 1908 Pp. 2-3.

31. Sind's Changing Map. *op. cit.*, Sheet 8. Map. 43, Sheet 9, Map 32.

arrived at the stage at which they are at present, and when the Ambala streams were also reduced in size owing to the accumulation of silt and sand, the Hakra dried up completely and the land, now called the Thar desert, became barren.

No doubt the connecting dry channels between the Hakra and its feeders in the upper reaches are now lost, being covered up with silt and sand. They were shallow, ill-defined beds, even split up into several collateral channels. But the deeper and degraded channel of the Hakra, lower down and within the region of our investigation, still remains and is clearly noticeable throughout Bahawalpur State, and then, with a short break, also throughout the Thar and Pat divisions of Sind, known as the Eastern Nara.

The next point is : Had the Eastern Nara anything to do with the Indus ?

First of all, let us settle the question about the real nature of the Hakra or Wahinda.

Considering the matter physiographically, the Hakra seems to be a distinct, moderate and perennial river system, largely independent of the Indus system and flowing round the corner of Bahawalpur and Sind almost parallel to it. It is a degrading stream, having cut a channel of its own, now known as E. Nara and quite unlike the aggrading Mihran or Indus of the mature type. The Indus itself did not flow through the Hakra valley. That is why no other river but the Mihran came in the way of Chach and Muhammed Kasim on their way from Alor to Multan. Nor was even the Sutlej mentioned by them. No doubt in this case also the flood-waters of the Indus then flowed eastwards and past Alor through the old gorge into the Hakro. They did so even lately before the opening of the Sukkur Barrage. Had the Hakra not dried up, owing to the failure of supply in its upper reaches as noticed above, the process of depositing silt and raising its own level by the Indus on the one (west) side and that of excavating its own channel on the other side by the Hakra, would have resulted in a sudden breach of the Indus into this low-lying channel, the Eastern Nara. As it actually happened and as the process of westering, too, was continued in its upper basin, the Indus or the Mihran grew at the expense of the Hakra and the result was that the former river was deviated to the west and it left the gorge of Aror entirely dry for that of Bakkar once for all.

It must be noted that any historic changes in the course of the Indus have taken place *suddenly* and not gradually, and this is quite in conformity with the law of silting up of the valley, already referred to in my previous monograph.[32]

When this event actually happened, it is difficult to settle. But the probability is that it was in the 14th Century A.D.

It is argued that the date of the Hakra drying up must be between 1151 A.D. and 1226 A.D., because the last mention of Aror was made by Al Idrisi in 1150 A.D. and the first mention of Bakkar in 1226 A.D. But this is not a very reliable method of fixing a date for a change in the river courses, because the Bakkar fort might have been re-built on account of a sheer political necessity, as Alor was so much exposed to external invasions, and also for about a century or so there may not have been any Arab writer after Al Idrisi to include Aror in his geographical treatises. Besides, Bakkar has been in existence since the Greek times. In all probability, the change in the Indus river course through the Aror gorge took place in the 14th century A.D. and it was about the same time that the Hakra dried up and the famished Nara remained behind. There is historical evidence also to be taken into consideration. The Sumras were driven to the Hakra valley by the conquering Arabs in the 8th century, who were themselves in possession of the mighty Mihran. They ruled at Muhammed Tur, now in the desert tract. from 750 A.D. to 1351 A.D. After the *devastation* of their territory on account of the drying up of the Hakra, the Sumras had to change their capital to Tatta and Samui. Then when the Sumras had gone, the Sammas became the masters of Sind. They, too, ruled at Tatta from 1351 A.D. to 1521 A.D., when Shah Beg Arghun defeated the Sammas once for all and rebuilt Bakkar with materials from the ruins of Alor, so that the destruction of the latter town was complete by that time.[33]

(B.) *The Indus System.* As regards the Indus system there is so much literature in Oriental languages, so old and strange are the traditions and so great are its wanderings that it is difficult to give a detailed reconstruction of the sequence of events. But it is possible to put together a concise account of the historical records of the Indus and of its tributaries and to check it with the physiographic features of the basin, and then to draw some definite conclusions.

32. *Pro. Ind. Aca. Sci.* B. Vol. No. 4 *op. cit.* Pp. 338-339.
33. "Historical Geography of Sind" *op. cit.* Pp. Part III, Pp. 35-36

The Indus was called "The father of rivers," while the sacred Sarasvati of the Aryans was the "mother." It is mentioned in the Zend-Avesta, the Vedas, the Puranas, the Mahabharata and the Ramayana. The Arab geographers grew eloquent over this river and called it the Mihran Darya. Strabo, the famous Roman traveller of the 1st century A.D., mentioned Sind as the frontier country of India, and the Indus the boundary between Iran and Hindusan. This unique river was famous as a great trading centre of foreign nations with India, and also sacred for bathing and efficacious in curing diseases for the natives.

This river-valley concentration of population seems to be the earliest in India and the people, who were first engaged in cattle grazing, later established themselves in villages and towns on its banks, serving also as river ports. At the same time, the Indus has been a most erratic stream in the whole of northern India, and we cannot say with certainty whether there is a square yard of land, between the high ground on the west and the easternmost course the river took, that has not been scoured by the Indus bed at one time or another.

An aggrading river in Sind with a long course of erosion and transportation of material for over a thousand miles in its upper reaches, it wanders over the plains, raising, by its own silting, the level on either bank and then breaking away into low ground on one side or another suddenly without a warning. There is no rejuvenation, no cycles of erosion in the valley but great vicissitudes of the river channels in various ages. Sir Richard Burton rightly said: "As regards the ancient course of the river Indus, infinite has been the speculation, the theorisation, the dissertation, the argument and the contradiction upon this much vexed subject."[34] It is only by examining some concrete instances such as the one mentioned in the *Chach Nameh* about the river at Alor, flowing by in the 8th Century A.D. and also the relics of the great civilisation discovered at Mohenjo Daro and other ancient sites, that one can be certain about the course or courses the river took at different times.

In any case, the Indus could never have wandered on higher ground i.e., the contour of 250 feet on either side at any time of

34. Burton Sir R.—"Sind Revisited", Vol. I, P. 202.

its career. Between these limits there is no doubt that the river flowed in different positions which I shall now discuss.

Seven Different Stages. Broadly speaking, it is possible to indicate the course of the Indus to some extent for the following periods :

I. Late geological period.	Post-Tertiary.
II. Prehistoric period.	Prior to 3000 B.C.
III. Greek period.	4th Century B.C.
IV. Arab period.	8th Century A.D.
V. Middle Ages.	12-13th Century A.D.
VI. Kalhora-Talpur period.	18th Century A.D.
VII. British period.	20th Century A.D.

During the last hundred years the geographical information regarding the Indus, especially its vagaries, growth of the delta country etc. has been gathered in details, but for all the previous periods it is found to be meagre and unreliable. Where historical references and archaeological ruins are not available, it is proposed to rely on the physical conditions of the valley in the preparation of Sind's historical maps.

I. *Late geological Period.* The Indus in late Tertiary times formed the lower part of the Indo-Brahm or Siwalik river, which flowed westward from the region of Assam hills along the foot of the Himalayas, carrying the combined waters of the present Indus, the Ganges and the Brahmaputra, and then turning from the Potwar plain directly south, ultimately fell somewhere into the sea now occupied by Kutch—Kathiawar.[35] This is now confirmed by the faunistic (fish-fauna) data[36] recently gathered. This region appears to be a part of the subterranean ridge along the submerged gorge of the Indus, in continuation of the Aravallis on one side and the coral attols of Laccadive and Maldive on the other, discovered by the Murray Expedition of 1933. (See my paper on the Indus, *Proc. Aca. Ind. Sci.* B. Vol. IV, No. 4, p. 320.).

II. *The Pre-historic Period.* The next trace of the Indus can be secured from the location of pre-historic sites, such as Mohenjo

35. *Pro. Ind. Aca. Sci.* B. Vol. IV 4 *op. cit.* Pp. 319-320.

36. Hora Dr. S. L.—"Distribution of Himalayan Fishes and its bearing on certain palaeo-geographical problems." Also "Comparison of fish-faunas of the Northern and Southern faces of the Himalayan range."

Daro about 8 miles W. of Chanhu Daro, about 20 E. of Narujo Dhoro and 25 miles E. of the present bed. No doubt the river must have supplied the necessary stimulus for settlements on both its bank. But the difficulty arises as to when, for example, the Indus flowed past Mohenjo Daro and when Narujo Dhoro, at present some 30 miles apart. We know that the floods in Chandhu Daro were more disastrous than in the former places. The only feasible explanation, therefore, is that when the main body of the river flowed in the neighbourhood of Narujo Dhoro and of Chanhu Daro, a branch of it, now nearly coinciding with the Western Nara, supported the population on Mohenjo Daro side. Subsequently, the main river channel left the former sites and occupied the channel of its Western branch for a certain distance, allowing the Western Nara to branch off much higher up than is the case at present; or it may be that the difference between the ages of the two cities is great, and the Indus swung from one side to another to feed both the places at different times. In either case it must have passed through the Dhoro Mohenjo as I have named the easternmost branch lower down in the map. The maximum distance through which it must have oscillated in Upper Sind is estimated to be 30 miles.

III. *The Greek Period.* It is impossible to follow the course of the Indus in very early historic times due to lack of any records. Darius the great got the river surveyed by Scylax, but there are no archaeological or historical proofs to enable us to plot its course in the 6th Century B.C.

As we approach the age of Alexander, a couple of centuries later, we get some historical references to indicate the nature of the drainage *e.g.* his oft-mentioned town, Patala, where the bifurcation took place and the two ports, eastern and western. While the former lay at the end of the Gharo branch opening into the Gizri creek, the latter must have existed at the end of the Western Puran as far as the Kori mouth. The problem of fixing Patala at the head of the then existing delta can be solved by accepting the theory that the Indus in Sind in historic times has *westered*, under Baer's Law and Parker's Law, so that the right bank of the upper cusp has been constantly under attack. I have, therefore, given Patala its approximate position on the map at about 35 miles S.E. of modern Hyderabad. The lower cusp, forming the delta proper, can be imagined to have rested directly against the southern boundary of Kohistan as the positions of Barbariko, Krokala and Alexander's Haven appear on the map. The Western Puran, opening into the Kori creek, must have formed the third side of the deltaic equi-

lateral triangle according to Nearchus.[37] Since there is no mention of another stream made by the Greeks, the Hakra must have flowed independently still. The port of Bakkar is mentioned in the Periplus, so that at least a portion of the Indus must have flowed here too.

IV. *The Arab Period.* The hydrographical conditions at the time of the Arab invasion are more clearly marked, the information found in the *Chach Nameh* especially being very valuable, as regards the 7th Century A.D. and later centuries. In lower Sind, the river had already opened out its curve, forming the excellent port of Debal on one of its branches in the growing delta, while the main Indus, taking the curve further towards the west, still flowed past Aror, being on the west of it, as is mentioned by the chroniclers. " Dur (Alor) is situated on the banks of the Mihran which runs to the west of the town.[38] The physiography of the region shows that not the whole of the Indus river could flow through the deserted gorge of Aror, now lying east of the town. A side branch of it or the flood waters of the parent river must have flowed past the old Hindu capital, and another side branch flowed past Bahmanabad (Mansura), further south through the Dhoro Puran. The flood waters of the Sutlej in the upper basin and other Ambala streams then fed the Hakra, which still flowed in much the same way as before, through the desert.

Majumdar, while exploring the region, has also pictured the Indus in Arab times as under :—

" An old bed of the Indus, which is very well-marked, falls on the way to Sakrand near the ruined fort of Mir Nur Muhammad. It is immediately to the west of the fort and runs north to south for a considerable distance; an eminence in the middle of the bed, which looks like an islet, goes by the name of Lidhar-jo-Daro. It is not however of any archaeological importance. This bed is supposed by the elderly people of the Sakrand Taluka to have been the continuation of what is popularly known as Sohnijo-dariva, probably identical with an ancient course of the Indus, traces of which can yet be seen in the Kandiaro, Naushahro, Nawabshah, Shahdadpur, and Sinjhoro Talukas of the District. Whether this is the same as the Mihran of the Arab geographers cannot be definitely ascertain-

37. *Jour. Sind. Hist. Soc.* Part II, *op. cit.* P. 36.
38. Elliot and Dowson *op. cit.* P. 79.

ed. But it is not improbable in view of the fact that the Mihran has been described as flowing in the vicinity of Brahmanabad-Mansūra near Dalor in the Sinjhoro Taluka in the 8th Century A.D. A portion of the old Indus bed, no doubt another link of the same Sohnijo-dariya, was subsequently visited by me at the village of Pijaro Naich (marked 'Pyareh Naith' on the Survey of India map), 11 miles to the north-east of Naushahro and to the west of the road to Halani."[39]

The lower loop channel of the Indus, connecting it with the Hakra, was probably the same connecting river shown in Raverty's maps, 3rd and 4th Transitions, and passing by Bahmanabad.[40]

V. *The Middle Ages.* The post-Arab geography of Sind is largely connected with the growth of the delta, the establishment of deltaic ports and the settlements along the banks of the Mihran, shown in the earliest maps of Sind by Arab geographers, Istakhri Ibn Haukal and others. In all these maps a loop of the Mihran, referred to in IV above, is shown, which includes the famous town of Mansura, after which the whole district is named. In those days only the two districts of Mansura and Multan were prominent. The river, by this time, had already assumed the bed in Upper Sind now occupied by it, but below Sehvan it had not yet settled down, the main stream flowing still eastwards. Then in the time of Ibn Batuta (14th Century A.D.), the sea receded from the port of Debal, and Lari Bandar came into use, as it had a better harbour. Later on, Tatta became the capital of Lower Sind, under the Sumra and Samma kings. The population of this part of Sind grew due to the migration of the people from the Hakra valley, which had dried up. According to Haig, the Kalri, the then westernmost branch of the Indus, was in existence, as Tatta was established on its bank.

Though there were changes taking place in Lower Sind, Sehwan and Bakkar in the north still remained well populated, and the invasions of the Delhi kings were generally directed towards these centres.

Attacks from Delhi continued during the regime of Moghul kings and emperors—the first to visit Sind being Humayun. It appears that the land between Umarkot and Tatta was then fertile

39. Majumdar *op. cit.* P. 36.
40. "Sind's Changing Map" *op. cit.* Sheet 4, Map 39. and Sheet 5 Map 40.

and the easternmost branch of the Indus, the Sir, must have flowed through this tract in the middle of the 16th century.

The establishment of Shahbandar by Mirza Isa Tarkhan, about the year 1555 A.D., clearly points out a further change and extension of the delta, and on this account, and owing to lack of easy communication, the centres of government in Upper Sind were getting out of control. Bakkar was actually besieged and taken by Akbar's army. The march of the Imperial troops through Sind, in 1591-92, was by the towns of Bakkar-Sehvan—Lakhi-Halah-Nasrpur, (then 65 miles S.E. of Sehvan), and Tatta, thus showing the probable course of the Indus towards the east of the present bed.[41] They saw the sea at " Moghul-bin ", also suggesting the limit of the coast and inlets of the sea existing at the time.

VI. *Kalhora-Talpur Period.* It is because of the detailed historical information available for this important period in the growth and evolution of Sind that we are on surer ground as regards the important hydrographical changes that have taken place during the 18th century A.D. The change which took place in 1758-59 was particularly remarkable, inasmuch as it made Ghulam Shah Kalhora establish Hyderabad as the capital of Sind in preference to Nasrpur, which fell dry further east. The Ren, about 70 miles long, and the main Indus channel extending up to 100 miles and watering a large part of Sind, got dried up. The south-east curve of the river took a westward turn and, at the same time, the Phuleli channel became the principal branch of the river, during the 18th century, A.D. This helped the establishment of Hyderabad a few miles south of it. Thus the Indus westered still more in this quarter, until it finally fell into low ground on the west of Modern Hyderabad, leaving the Phuleli dry for the Pinyari-Sattah.

The growth of the deltas was also marked by the appearance and disappearance of the river mouths ; the Baghar and the Satta were the two main navigable branches. The Cutch earthquake of 1819 broadened the Koree Creek, and the Kukaiwari and Khedewari creeks appeared.

So, while the river went on westering, its branches towards the east became drier and drier *e.g.*, at first the Dhoro Puran, then the Western Puran, the Phuleli-Ren, the Gungro, and lastly the Pinyari-Sir became dry in turn. The distance between the two main

41. *Ibid.* Sheet 9, Map 46.

branches was also greatly reduced and the mouth of the river formed by the two principal branches became narrower.

VII. *The British Period.* During the last hundred years the Indus has not shown any great change in its upper course, although its actual bed is found swinging from left to right and right to left year by year e.g. the oscillations below the Bakkar gorge since 1900, plotted by the Indus River Commission in their Records.[42] It is shown that the channel is permanently fixed only for about 3 miles below the gorge and not more. In the middle of Sind the river cannot western any more, as it now rests against the high grounds of the Kohistan region. But in the deltaic area evolution is continuous, though slow, and old channels are sometimes reopening. After Shahbandar, Keti Bandar came into use and now both Shahbandar and Sukhi Bandar have been re-opened. The two principal branches, the Ochito and the Haidari, are pointing south-westward, which is the present direction of the deltaic growth. There are some 13 mouths of the Indus traceable now, the principal being Pitiani, Hajamro, Tarshion, etc.

But the greatest changes in the drainage of the land during the British period are in connection with the Sukkur Barrage project whereby over 5000 miles of the main canal works have been constructed out of only about 500 miles of the principal river course available in the region. Consciously or unconsciously, many of the old river beds called Dhoroes have been thereby absorbed. The final shuffling of population is now going on in Sind.

Such is the history of the Indus through the ages and of the settlements that rose and fell on its banks.

SUMMARY AND CONCLUSION

The lower Indus basin (Sind) has afforded facilities for some of the earliest human settlements in India, although it is an unstable land, with an unstable population, depending chiefly upon an unstable water supply. It is a land also of changing river courses, changing lakes, changing coastline, an advancing delta, intensely weathering Tertiary rocks and accumulating sand. Even the sand-hills of the desert are changing as the winds blow during the year. The region, again is in the neighbourhood of the danger zone of Northern India and is unique in its numerous hot-springs.

42. *Proc. Ind. Aca. Sci. op. cit.* P. 338 and Plate 14.

There is a possibility of climatic variation as well and of gradually rising level and alluviation. All this means instability of human life.

An antechamber for the whole country, with such a classical river as the Indus, Sind has not a single classical town left, except Sehwan (Sindomana) and that too in a partially decaying state. Floods were the greatest menace to human habitations, Mohenjo Daro itself being thrice abandoned on this account. Again and again, people tried to resettle on mounds higher up, the Indus left its channels, and a whole river the Hakra—got dried up in the Pat-Thar section. Thus towns and villages often vanished.

The paper has been based on a detailed study of I. *Geomorphology* e.g. (a) Aggradation by the river and aeolean agencies (b) Erosion by external agencies (c) Flood menace (d) Tectonic changes. (e) Growth of the delta, etc.

II. *Hydrographical changes* e.g. (a) Unstable water supply and water table, (b) unstable springs, drainage, river piracy, etc.. (c) unstable lakes, and (d) unstable river channels.

III. *Other changes* in human settlements, due to political causes etc.

Thus some 25 old sites with old river channels etc. have been indicated by me in the map of Sind (See Plate I). The growth of the delta in all the seven stages has also been traced in it and the positions of the old and new ports pointed out. The Sukkur Barrage with its perennial water supply and its final redistribution of population, may mean more or less stable settlements in days to come.

Place-Names in South Kanara District

By

Rao Bahadur C. M. Ramachandra Chettiyar, B.A., B.L., F.R.G.S.

Introduction :—South Kanara is a narrow strip of land situated between the Western Ghats and the Arabian Sea, having a length of 150 miles north to south and a breadth of 25 to 50 miles east to west. The land slopes from the east to the west, the eastern portion being bounded by high hilly Ghats studded with peaks of various heights. Their spurs sometimes approach the sea-coast towards the west. There are a number of valleys through which rivers flow from the Ghats towards the sea. These rivers are mostly short and rapid. Practically no lakes exist in this district and irrigational works of importance are also rare. The rains are heavy ; and paddy and other wet crops are raised with rains alone without the necessity for developed irrigational devices as found in the east. The names of places are not of very many varieties and consequently a study of place-names becomes a simpler and drier subject when compared with that of the other districts. Moreover due to the want of sufficient material regarding the names of hamlets, a comprehensive study has not become possible for me within the short space of time before me. Yet, I have made use of all the available names which I could get from the published records.

Geographical features :—With the help of illustrations available from place-names, we will try to define the various geographical features of this district and try to prove that even place-names could afford sufficient data for determining the chief features of the land.

I. *Hilly country* :—As already said, the eastern portion is studded with hilly ghats and the country slopes towards the west from the ghats. The ghat-portions range from 2000 to 6000 feet in height with a few valleys between them. The entire range could be divided into five groups, there being a valley or gap between each group. Through the gaps ghat-roads pass from this district to the Mysore plateau on the east.

Group I : Koranigatta, Elagatta, Devakonda, Kotachadri.

Group II : Bisali, Kalkunji.

Group III : Kudaramukh, Ballal Raja Drug, Chibidri, Ammadikal.

Group IV : Subramania.

Group V: Bedadka, Kandadka Malai.

Besides these ranges there are stray hills and they are Kodinjakal, Bulla Malai, Passodigumpe etc. The various ghats through which ghat-roads pass are: Kollur ghat, Hosangadi ghat, Someswara ghat, Charmadi ghat, Shiradi ghat, Bisali ghat, Sampaji ghat.

These ghats separate the above-said groups of mountain ranges.

The above names are given in order from North to South. Their suffixes denote the equivalent for a mountain or peak. They are Gatta, Konda, Adri, Kunji, Mukh, Drug, Kal, Malai. Among these names Adri and Drug being of Sanskrit origin would have come into vogue in recent days, while Gatta, Kal and Malai are of local origin and would have been named from the earliest days. The word Konda is also of Telugu terminology, while Kal and Malai are of Tamil.

The place-names of villages which testify that they are near the hilly tracts are not many in this district, but yet the few examples which are found could be collected for the purposes of comparative study.

They are:—

Suffix.	*Meaning*	*Number of usages.*	*Examples.*
1. Kal	Rock	4	Panjikal, Jadkal.
2. Kodu	Peak	5	Nadukodu, Kasarakodu.
3. Gudde	Mound	2	Daragudde.
4. Kundi	Mound	1	
5. Drug	Hill fort	2	Hosadrug.
6. Kone	Corner	1	Kempadkone.
7. Katte	Crest of a hill adjoining cultivation, a water-shed of a hill.	2	Nattikatte.
8. Sila	Rock	1	Kamalasila.

II. *Water Courses*: As already stated, this district is full of short rivers without lakes and big irrigational works. The rivers are not navigable to any considerable length and hence are not of much use to the country. The estuaries are broad ones and are some times used as ports. Lagoons or backwaters are formed

near the coast, though not so many as are found in Malabar and Travancore. The principal rivers are :

1. Netravathi with its tributary Kumaradhara.
2. Gurpur river.
3. Gongoli with its tributaries Kollur, Haladi and Sukranadi rivers.
4. Chandragiri river (Old name Perumpuzha).
5. Sitanadi.
6. Svarna nadi.

The above names show that most of the rivers have names of Sanskrit origin and they would not have been the original local names. Rivers became sacred in character and as religious fervour increases, mythological origins and names are attributed to them in course of time. Chandragiri river with the ancient name of Perumpuzha is the dividing line between Malabar and Tulu country. In Dravidian languages, the word which denotes a river is generally *Aru*, while *Nadi* which is its Sanskrit equivalent would have come into vogue later on. For instance, the Tamil name Noyal Aru has become Kanchima Nadi in the Perur Purana. Hence we could easily infer that the names of rivers in this district also have been of later origin. This is supported by a fair preponderance of place-names ending with the suffix 'Aru' and by the absence of the suffix "Nadi" anywhere. There are 29 names ending with 'Aru' among village names in this district.

Examples: Adyar, Ekkaru, Chetiyaru, Anjar, Nanjar, Pilaru etc.,

The other names which denote water-courses are :—

Suffix.	*Meaning.*	*Example.*
1. Eri	Lake	Sulkeri
2. Kula	Tank	Arkula
3. Kare	Pond	Badakere
4. Halla	Ditch or Rivulet	Devanalla
5. Hole	River	Golihole
6. Kunda	Pond	Uppinakunda.

The absence of many place-names signifying tanks and other water-courses points to the fact stated above, that they are few or rare. In fact, the abundance of rainfall makes it unnecessary to have big irrigational schemes in this district.

III. *Plains*: The district being merely a narrow strip between the hills and the sea with a sudden slope towards the west, vast plains are not found. Most of the country is cut up by rapid rivers into valleys. Hence the places indicating plains are few and far between. The following names indicate a country or its divisions :—

Suffix.	*Meaning*	*Examples.*
1. Nadu	Part of the country	Edanadu
2. Nada	do.	Bappanada, Karnad
3. Pranthiya	do.	Pranthiya
4. Sthala	Place	Dharmasthala
5. Mannu	Earth	Kodamannu
6. Moguru	Wet land growing one crop of paddy.	Jappina Moguru, Sulkeri Moguru.
7. Mugai	Village land	Edarumugai
8. Mula	Corner	Kudamula
9. Bettu	Land capable of producing one crop of rice	Hosa bettu
10. Banjar	Waste land.	
11. Bailu	Low lying land of good quality where rice is grown (1 to 3 crops).	Kodiyalabail, Amashebailu.
12. Majal	Land producing two crops.	
13. Potla	Land submerged under rains.	

A suffix Padavu is frequently found, which may be connected with land.

IV. *Civic Life*: The country was well civilised from ancient days and so villages and towns have come into existence from the ancient days. There are more names which denote civic life than any other feature. The numbers denoted against each suffix indicate the prevalence of civic life.

Name.	*No.*	*Meaning*	*Examples.*
Uru	145	Village or town	Mangaluru, Mudnuru, etc.,
Adi	12	Village	Charmadi, Shiradi
Padi	28	,,	Amblepadi, Chitrapadi.
Palli	6	,,	Bairupalli, Parampalli
Pura	5	Town	Sivapura, Manipura
Halli	4	Village	Honnehalli, Molahalli
Valli	3	,,	Halevalli, Shivalli
Hatti	1	,,	Alatti
Vara	11	,,	Udayavara, Kuntavara, Nilavar.
Tala	10	Village	Kattala
Patna	1	,,	Kasipatna
Kala	1	Town	Karkala, Jarkala
Ja	16	Place of residence	Balanja, Kalanja
Je	20	,,	Annanje, Elinje
Manai	1	House	Sedimanai
Grama	1	Village	Kudigrama
Angadi	7	Shop or bazaar	Hosangadi, Uppinangadi
Bagilu	3	Courtyard, entrance	Sirbagilu
Mangalam	1	Gifted village	

The above names show that the word 'Uru' is the most prominent name found in this district. 'Padi' is another name for a village which is also used in Tamil. Tamil "P" becomes Kanarese "H" and in colloquial terms the aspirate disappears. For example, Patti becomes Hatti and then Atti; Palli-Halli-Valli-Alli; Similarly Padi-Hadi-Adi. In this district the word Padi is prominent in Mangalore, Udipi and Uppinangadi taluks whereas Adi is prominent in Coondapur taluk. So we can infer that the current of colloquialism has gone from South to North.

Pura is found in five names and Vara in eleven names. In the East, Kanchipuram has become corrupted into Conjeevaram, pura becoming vara. Similarly in this district a number of names end with vara.

Examples are : Udayavara, Nilavara etc.

The words ending with Ja, Je, Ka, Kala are peculiar to this district. They merely denote the place or locality. Examples are :

Kalanja, Annanje, Badadka, Karkala.

V. *Historical* : Names which indicate the origins of places in History are fewer when compared with other districts. There are a few forts found in this district. The few that exist like the forts of Kumbla and Bekal are of Vijayanagar origin. The only fort which denotes Muhammadan origin is that of Jamalabad which is situated at the entrance of a pass leading from the Mysore plateau (Charmadi Ghat).

Though this district has a vast coast-line, there are very few ports of any importance. Malpe, Mangalore, Ullal and a few others have very little trade. The Portuguese were the first who had anything to do with these ports. Hence the words which indicate a port are rare. The port of Mangalore is known by the name of Kodiyala bandar (Bandar meaning port).

VI. *Occupation* : Agriculture is the important occupation in the district as elsewhere in our country. The suffixes which denote agriculture are :

Suffix.	*Meaning.*	*Examples.*
1. Mogaru	Land growing paddy	Angadi Mogaru
2. Bettu	do.	Aiabettu, Hosabettu
3. Todu	Garden	Kaltodu
4. Bailu	Land where paddy is grown	Kodiyala bail
5. Kuduru		Badakuduru
6. Mannu	Earth	Kodamannu
7. Padavu		Edapadavu

The words which denote trade are

1. Angadi	Shop	Hosangadi, Beltangadi
2. Puttige		Kallaputtige
3. Kada	Shop	Marekada

The word which denotes other industries is

Ala	Mill	Kodiyala

Some prefixes denote traditional occupations.

VII. *Religions* : The various Religions which were prevalent in this district have left their traces in place-names.

1. *Saivism*: The following names which end in the name Isvara denote the sacred shrines of Siva. Nilesvar, Manjeswar, Kotasvar, Crimanjasvar, Somesvar. Besides this suffix Isvar, there are places like Sankaranarayana and Subramania which have religious significance.

2. *Dvaitism*: Udipi with its shrine of Krishna is the centre of Madhvaism with eight mutts and a few villages nearby abound in Madhva community. Shivalli (Shiva+halli) contains Brahmins who have adopted Dwaitism as their religion.

3. *Christianity*: The Portuguese are responsible for the existence of a large number of Christians in this district. But there are very few Christian place-names. Ferangipet and St. Mary's Islands are examples of names showing their influence.

4. *Mohammadanism*: Arabs were the first traders who introduced Mohammadanism. Later on, Hyder and Tippu were responsible for a large number of conversions. The chief traders were and are Mohammadans. According to tradition Cheraman Perumal on his conversion to Mohammadanism built mosques at Nileswar etc. But yet, very few village-names are found indicating Mohammadan influence. Jamalabad is an example of Mohammadan influence. Jamal+Abad=Town of Jamal. Bahadurgad is another example.

5. *Jainism*: Jains were very prominent in this district. There were a number of Jain chieftains ruling over various parts of the country. Karkal, Mudubidri and Venur are their important centres. Even now there are a number of influential families living in those parts. Their former power and position are proved by the existence of innumerable rich relics in the shape of Bettus (enclosures with statues). Basthis (stone temples for thirthankaras) and sthambas (fine lithic carved pillars).

In this connection it will be interesting to give the percentage of population according to religion.

Others	0·63%	Muslims	13·13%
Hindus	8·91%	Christians	77·33%

Among others, come Jains who form 10,000 or 1/3 of the entire population of that community in the Madras Presidency. The Jains of this place are indigenous persons and not money-lending or trading strangers from the North.

VIII. *Languages*: According to the census of 1931, the following distribution of languages is found in this district.

	Population.	Kanarese.	Per cent	Konkani.	Per cent	Malayalam.	Per cent	Tulu.	Per cent
Section I.									
Coondapur Taluk	1,38,909	1,17,972	84·9	20,937	15·1	—	—	—	—
Section II.									
Udipi, Karkal, Mangalore, Puthur	8,65,054	1,03,765	12·0	1,63,671	18·9	85,995	9·9	5,11,623	59·2
Section III.									
Kasaragode and Aminthivi Islands	2,83,054	22,815	8·1	—	—	2,11,129	74·6	49,110	17·3

From the above figures it will be clear that among the languages of this District, Tulu is spoken by the largest number of people numbering up to 5,61,623. They occupy the central taluks of the district. Kanarese comes next and it is spoken mostly in the northern taluk of Coondapur, Konkani comes next and it is spoken in the northern and central taluks. Malayalam is the chief language of the southern taluk of Kasaragode. Roughly speaking the rivers Netravathi and Perumpuzha separate Malayalam and Tulu languages and the river Svarna Nadi separates Tulu section from Kanarese people. Hence South Kanara is not a purely Kannada district as denoted by its name but is a polyglot district, the southern taluk sharing the mother-tongue of the neighbouring district of Malabar and the northern taluk sharing the mother-tongue of the adjoining North Kanara, and the central taluks belonging to Tulu mandala. In Tamil literature among the divisions of land into various Nadus, Tuluva Nadu is mentioned as one of the divisions.

The place-names testify to this division of the languages. Those of southern Kasargode taluk indicate Malayalam origin. The names of 25 villages are of pure Malayalam language. Chervathur, Kanhangad, Kotikulam, Kasaragod, etc., are some of the examples. In the central taluks Tulu names are prominent. The prefix of Mudu, and Padu, Tenka and Bada are siginificant. In Coondapur taluk pure Kanarese names are prominent.

IX. *Administrative features*: Place-names often testify administrative features: if a village is too big for the purpose of administration, it is often divided into two or more smaller villages and such a division is distinguished by suitable prefixes. In this district the nomenclature is similar to that which is found in other eastern districts. The following examples illustrate the abovesaid idea:—

Prefix.	*Meaning.*	*Examples.*
1. Mudu×Padu	East & West	Mudu bidare and Padu bidare
2. Tenka×Bada	South & North	Tenka Bellare, Bada Bellare.
3. Chikkak×Hiriya	Small & Big	Chikkapadavu, Hiriangadi
4. Hala×Hosa	Old & New	Hala angadi, Hosa angadi.

Moreover, a number of suffixes denote the kind of land which surrounds the villages, particular names being given to distinguish

them for purposes of revenue matters. Such suffixes are Mogaru, Bettu, Bailu, Banjas, Majal etc. The meanings of the above-said terms and examples for them have been given already.

X. *Special features*: A few village-names are very interesting ones and they denote some particular matter which gave rise to the origin of those places. A few examples will illustrate them.

Mangalore taluk.

Neermarga	Waterway
Thanneerboomi	Waterland
Barya	Wife

Uppinangadi taluk.

Ivattukkolu	Fifty families
Charvaka	Name of a philosopher
Dharmasthala	Place of virtue
Kodaiyala	Flag mill
Gnayathirpu	Just judgment
Subramanya	Name of Siva's son
Thanneerpatha	Waterway

Coondapur taluk

Nandavana	Flower garden
Sankaranarayana	Siva and Vishnu

Udipi Taluk.

Kavadi	Archlike structure carried by devotees to Subramania temple.

Karkal Taluk

Iruvayalu	Two fields.

In the above list the names themselves signify the origin. Subramanya is a sacred temple near the Ghats which is frequented by a large number of pilgrims. It would be interesting to note that there seems to be some connection between this place of pilgrimage and Tamil literature. The ancient work of 'Tirumurugattrupadai' written by the poet Narkeerar of the Sangam age in the early Christian era gives the names of six abodes of God Subramanya one of which being Tiruveragam. The learned commen-

tator 'Nachinarkiniyar' who lived about the 10th century A.D. has noted that Tiruveragam is the sacred place situated in Malainadu or hilly country. In modern days Swamimalai near Kumbakonam in Tanjore district is believed to be Tiruveragam, and is worshipped as one of the six '*Padai veedus*' of Subramanya. The modern notion is contradictory to the view expressed by Nachinarkiniyar. Recently a poem by the name of 'Karmandala sathakam' has been unearthed and published. It deals with the features of Karnataka or Kannada country. In one of its poems it refers to Subramanya of South Kanara as Tiruveragam. Hence it is interesting to note that this place has something to do with Tamil literature.

Shirur	Village of Goddess Lakshmi
Hosangadi	New shop
Kasargode	Kasara=wild buffalo, gode=peak
Nilesvar	Nilakanta isvaram
Manchesvar	Manch=bedstead, isvar=Lord
Chandragiri	Moon hill
Bekal	Be=Burning, kal=stone
Udiyavara	Udiya=rising, vara=pura=town
Hosdrug	Hosa=new, drug=fort
Kalyanpur	Auspicious town
Chitpadi	Small village
Balisavira	Thousand families
Uppinnangadi	Salt bazaar
Bailangadi	Plain shop
Jamalabad	Town of Jamal (Old name being Narasimha Ghad.)

In the above list the meaning of suffix Kodu in the place-name Kasaragode is given as peak. In Tamil and Malayalam the word Kodu often occurs, for example Tiruchen*gode*, Tirupparan*godu*, Olava*kodu*, Kanji*kodu*, Koli*kodu* (Calicut). In Tamil Kodu means peak and the places also signify that meaning. But in Malayalam though Kodu signifies peak, places like Kolikode (Calicut) do not lie near any peak. Hence, objection could be taken to the significance of the suffix. Perhaps, it is the corruption of some other term. But it also happens that certain place-names are given euphemistically; for instance, a place where no water is found is called Tadagam meaning lake or samudram meaning ocean. Similarly kodu also might have been so used.

Communications of South Kanara District

BY

N. SUBRAHMANYAM, M.A., L.T., F.R.G.S.

The District of South Kanara is situated at the farthest distance from the metropolis like Bellary, Vizagapatam or Tinnevelly. It lies between the Western Ghats and the Arabian Sea, and is bounded on the South by Malabar and on the North by North Kanara (Bombay Presidency). It stretches to a distance of about 150 miles North to South and is about 25 miles broad in the northern part and about 50 miles in the southern part, being widest in the latitude of Mangalore. The land slopes westwards from the Western Ghats to the Arabian Sea, and is cut by rivers which cross the District, making dendritic patterns. At their mouths creeks, lagoons and backwaters are formed, making the coast-line somewhat indented. All these rivers are tidal, and afford easy communication for several miles inland for small craft. Most of them have bars at their mouths; and the bar at Mangalore has only 6 or 7 feet of water, so that only small vessels can enter the harbour. The entire coast of the District, which is thus broken, is generally low and sandy, with huge and rugged rocks cropping up in places as near Malpe.

Mangalore, the Headquarters of the District is linked with Madras by the broad gauge line of the South Indian Railway through the Palghat gap. This line was completed so recently as 1908 by continuing it from its former terminus at Calicut; but, it has not been extended further north. While highly useful for passenger traffic, it has not been of equal importance commercially, owing mainly to the fact that the two adjoining districts of Malabar and South Kanara are too similar in climate and products to need mutual exchange of commodities. The rise of Cochin as a first class port does not seem to have materially affected the position, as the sea-borne trade of Mangalore continues to be much the same as before.

It is interesting to note that there is no through coastal road connecting South Kanara with Malabar, competing with the railway for passenger traffic. Even within the District, the coastal road, which runs right through the whole length of it from North to South more inland in some sections than in others, has the great

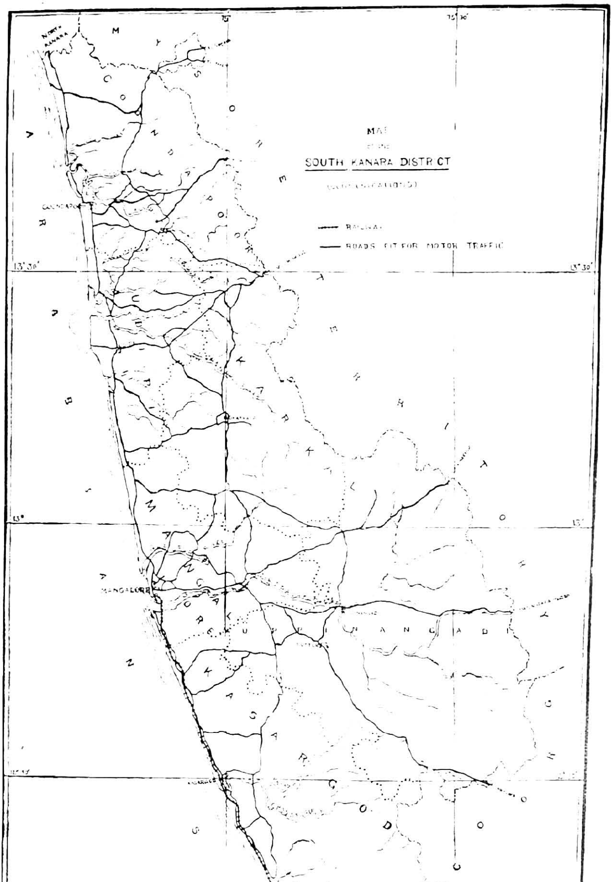
disadvantage of running in sections, broken by backwaters and river-mouths which have to be crossed in ferries,—though the region itself is fairly level and well-populated with busy local traffic. It is for this reason that the interior road running from Hosdrug to Udipi which is unbroken being bridged right through, has continuous bus service, and more largely used for through passenger traffic than the coastal road. Unlike in the South, there is continuous road connection and consequent bus service between South and North Kanara Districts in the North.

It is a remarkable fact that while commercially the North to South routes and traffic are insignificant, the East to West routes connecting the District with the country above the Ghats and the traffic along those routes are very important. Seven Ghat roads connect Mysore and Coorg with South Kanara ; and these in order from the South are :—1. The Sampaje Ghat Road which runs from Mercara ; 2. The Bisli Ghat Road, which enters the district near the trijunction of Kanara, Mysore and Coorg ; 3. The Shiradi Ghat Road which runs from Hassan and Saklaspur ; 4. The Charmadi Ghat Road which connects with Chickmagalur and Kadur ; 5. The Agumbi Ghat Road which connects with Shimoga; 6. The Haidarghat Road running from Bednore or Nugger and Sagar ; and 7. The Kollur Ghat Road, the most northerly one, connecting with Sagar. The first five of them converge on Mangalore, wherefrom trade flows out as through a funnel ; while the two northerly ones converge on Coondapoor, the headquarters and port of the northermost taluq of the District.

Mr. H. G. Punja, on the authority of the Mysore Gazetteer, says : "The construction of the roads connecting various parts of Mysore with ports on the West Coast seems to have closely followed the exploitation of the hill slopes in Mysore by coffee planters. There seems to be no indication that there was any road connecting Mysore and Mangalore before 1831. During 1831-56 several roads were constructed connecting the important towns of Mysore and extending on all sides to the frontiers. It was only subsequent to 1856 that outlets were provided to the West Coast by the construction of the following roads..........By these lines the whole Mysore State to the remotest corner is in communication with the West Coast."*

There is a noticeable plan in the lay-out of the roads running from Mysore and Coorg to the plains of South Kanara. To cross

* Journ. of the Mad. Geo. Assn., Vol. XIII, No. 3, p. 287.


SOUTH KANARA DISTRICT
ROADS FIT FOR MOTOR TRAFFIC
NORTH KANARA
MANGALORE
13°30'
13°

the Ghats, advantage has been taken of the existence of the valleys cut by the west-flowing rivers; in their next stage to avoid rise and fall, the roads now run along the open ridges of the laterite plateau in between the river-valleys; and to cross the rivers in their lower courses where they must before reaching the coast, bridges have been constructed. In this way the difficulties of relief are overcome.

Road-making in this District is both difficult and easy—difficult because of the heavy downpour of rain eroding the surface; but easy because of the nature of the surface which is laterite in the main, granite in the shape of outcrop boulders being available close by to bond it where necessary.

On these roads now ply buses and lorries, rapidly taking the place of the bullock-carts. The Canara Public Conveyance Co., Ltd. has set an example for all the districts in South India. Its varied routes and the routes carrying the service to the several bus and railway centres of Mysore, Coorg and North Kanara; its running to scheduled time; its wayside choultries for passengers' convenience at their several offices on each route; and its linking village life with town in all matters of communication; with staff made to be efficient and courteous—there is not the like of it anywhere else in South India. The rapid concentration in motor roads has been throwing many a footpath and cattle-track between plateau and plain out of use.

The diffusion and infiltration from the plateau to the plain of the Canarese-speaking peoples is not a process of to-day, but has been going on through the centuries. By vicinage Malabar has flowed into South Kanara; and in modern times the railway as well as political administration has linked up Mangalore with the East Coast; while the steamship has linked it up with North Kanara and Bombay.

Mangalore and Environs

By

A. B. M. Periera, M.A., L.T., Dip. in Geo.

I. Situation, General Appearance, and Climate.

Mangalore Taluk is the most central of the coast taluks of South Kanara. The Kanara sea board extends over 58 miles in the north and 55 miles in the south of the taluk. The town occupies almost a central position in this central taluk. It is this central position with reference to the district at the convergence of natural routes that has been responsible for the importance of Mangalore. Mangalore has been both a political and commercial capital from early times.

It is also the chief Port of the District. Among the more important ports and potential ports, Malpe in Udipi Taluk ranks first. It has a protected anchorage but shallow waters and dearth of inland roads limit its importance. Mulki is worse off, as the coast is rocky and dangerous, in addition to poor means of inland communication; while Baindur may be discarded as being too far to the north and cannot be a port for the district.

Situated on the west coast of peninsular India in about the same latitude as Bangalore on the interior plateau and Madras on the east coast, Mangalore occupies a position of great interest. " The latitude of Mangalore is one of two most important points in India. It is at the extreme end of the arc of parallel which crosses the peninsula of India in latitude 13° from Madras to Mangalore passing through Bangalore midway. 'This arc is of special interest because it is situated much nearer to the equator than any similar arc that has as yet been measured on any part of the world.' "

Mangalore otherwise known as Kodial Bunder in 12°5′N. and 74°49′E. longitude is situated on the backwater formed by the convergent mouths of the Netravati and Gurpur rivers on their north and east sides; and consequently it has water on the south and west sides. It is 370 miles west of Madras and 418 miles south of Bombay. It is the chief town and administrative headquarters of the South Kanara District; one of two municipalities in the district; and it has a great trade. It is the terminus of the South Indian Railway and forms the westernmost point served by railways in the Madras Presidency.

As regards the general appearance of the town, the following description by Walhouse in Fraser's Magazine is illuminating. 'It is difficult to imagine a wider contrast than exists between the east and west coasts of the Indian Peninsula. The general aspect of the former is a long barren sandy shore stretching monotonously away till fading in the heat haze, and only redeemed from utter dreariness by the heavy surf that advance in three swelling lines, one after the other, each rising higher and following its foamy crest more darkly as it nears the beach, on which it breaks with a sound roar deeper and more sustained than any heard by Homer. But there is no shade no refuge. Very different is the West Coast. From Cape Comorin upwards (northwards) it presents continually varying panorama of grand and picturesque scenery.' This last phrase applies aptly to Mangalore. It may be described briefly as 'a clean, picturesque town, embosomed in coconut groves.' 'Viewed at from the sea or the Court Hill or any other position of vantage it presents the appearance of a vast coconut plantation broken here by a church spire and there by a factory chimney. The rivers and the slight topography enhance the beauty so that the town may be said to possess all the charms of an upland country town being very undulating and practically covered with groves of arecanut, coconut palms and other fruit-bearing trees.'

The Netravati and Gurpur rivers that form the southern and western boundaries of the town form bread shallow channels, studed with small islands, navigable for boats of 3 tons for a distance of 12 miles up to Buntwal. The rivers rise in flood during the rainy season and cause much damage.

The soil is generally gravelly except in Wards 1, 5, 8, and 9 where clay is met with. Along the river valleys the soil is alluvium ; but elsewhere the soil is quartzose gniess which decomposes into white, yellow or reddish felspathic clayey rocks which in many places become laterite, a stiff deep red clay often seamed with white and yellow layers ; when exposed to the air, the surface on account of its iron content solidifies into black rough rock universally used and very durable as building material. In places, outcrops of granite show themselves through the laterite.

The sub-soil water occurs at depths varying from place to place. It occurs at a depth of 15 to 20 feet in coastal places ; but in the interior, 45 feet may be put down as the average figure. The depth of the water-table also changes with the season. In the wet season it does not exceed 15 feet in all places. The water usual-

ly contains some iron salts due to percolation through laterite layers.

The general slope of the land is westwards from the central hills. But there are hills and undulations in all directions so that the heavy monsoon rainfall is easily drained off in a short time.

Mangalore with other places in the same latitude on the west coast has a hot and humid climate. No month may be said to be cold. The mean temperature ranges from 78° to 84° F. April and May are the hottest months recording mean temperatures of 84° F. From April, days begin to be longer and the bright tropical sun beating through the thin rarified atmosphere withers all delicate vegetation ; the ground gets parched and cracks where the soil is clayey, under the effect of the intense heat. The high humidity tends to enhance the unpleasantness of the tropical day and the whole atmosphere feels stuffy. The sea however, exercises its benevolent influence by sending in gusts of cool breeze at the time of the day when it is most desirable. The alternation of land and sea breezes is a regular feature here tending to mitigate the effects of a hot and moist climate.

The rainfall regime is typically monsoonal. The rainy season starts in the first week of June and continues till the end of October. It is succeeded by a prolonged period of drought extending over 7 months. The rainfall in an average year is about 124 and of these over 110 fall during the months June to October. The rainfall is extremely reliable though the period of incidence of the monsoon may vary. There are on an average about 117 rainy days in a year. Mangalore enjoys a fairly equable and healthy climate.

Months.	Mean of daily Maximum		Mean of daily Minimum.		Mean of daily mean.	
	Mangalore.	Madras.	Mangalore	Madras.	Mangalore.	Madras.
January ..	89	85	40	68	79	76
February ..	88	87	72	69	79	78
March ..	90	90	75	72	81	81
April ..	92	93	78	77	84	85
May ..	91	99	79	81	84	90
June ..	85	99	75	81	79	90
July ..	84	90	74	79	78	87
August ..	84	94	74	78	78	86
September ..	84	93	74	77	78	85
October ..	86	89	74	75	79	82
November ..	88	85	73	73	80	79
December ..	89	83	70	70	79	77

Months.	Average Rainfall.		Relative Humidity.		No. of Rainy Days.	
	Mangalore.	Madras.	Mangalore	Madras.	Mangalore.	Madras.
January ..	0·1	1·4	63	84	0·1	2
February ..	0·1	0·3	67	83	0·1	1
March ..	0·1	0·2	71	79	0·2	0·3
April ..	1·2	0·5	70	75	2	1
May ..	6·1	1·1	73	66	7	1
June ..	36·4	1·9	88	62	25	4
July ..	36·8	3·9	91	70	27	7
August ..	22·3	4·6	90	75	25	8
September ..	10·3	5·0	87	78	15	7
October ..	7·4	11·6	84	83	10	10
November ..	3·1	14·1	79	84	5	11
December ..	0·5	5·8	68	83	0·7	5

II. HISTORY

Tradition sets down Mangalore as a town of Tuluvanadu, which with Kerala makes the West Coast of the Presidency. In historical times, Mangalore was a port of Hindu Kings, before, during, and after the Vijayanagar Empire. The Portuguese built a fort here (1505), for trade; and ruled later on, building Churches, making Christians, as well as settling down themselves. From them, it passed on to Ikkeri Rulers. Hyder took it in 1763 and both he and Tippu made it their naval yard. Falling into British hands in 1799, it grew and has been growing save for the burning in Coorg Insurrection (1837). In the annals of the Town, these are important dates:

1825 : Headquarters of South Kanara District.
1834 : Advent of Basel Lutheran Mission.
1865 : Its building Weaving and Tile Factories.
1866 : Municipality constituted.
1879 : Advent of Jesuits.
1880 : St. Aloysius' College founded.
1898 : Completion of piers and tramway at wharf.
1908 : Completion of Railway linking to Calicut.

All these have contributed to the development of the town.

III. POPULATION

The Municipality of Mangalore comprises an area roughly triangular in shape with its apex in the south. The greatest length is 3½ miles north to south; and at its broadest part in the north

it is about 3 miles east to west. The town includes an area of 5·23 sq. Miles. Up to 1935 the town was divided into 9 Wards but since that date the town has been divided into 26 Wards. The town is a land of gardens and each house has its garden surrounding it. More than 50% of the land is occupied by residential buildings; 6·4% industrial and railway; over 25% agricultural and waste land and about 7% is occupied by roads and streets. From these, it is clear that the town is largely residential with a strong commercial turn.

The population has more than doubled itself within the past 60 years. At the last census it was 66,756. The following table gives, the population from 1871 to 1931.

1871	29,712	1911	48,112
1881	32,099	1921	53,877
1891	40,922	1931	66,756
1901	44,108		

The average rate of increase of population for the district is about 7% but in the decade 1881-91 the population of Mangalore increased by 8,823 or 27·5%. This was due to the establishment of tile and weaving factories in the town, the increased demand for labour and consequent immigration. The next rapid rise in the population is in the last decade when it rose by 23·9%. The immigration during these years was not large but the excess of births over deaths was on an average about 800 per annum as against 176 the average for 1911-1920. This high rate of natural increase may be regarded as the main cause for this large increase.

The distribution of the population at the last census was as follows :

Ward.	Hindus.			Xtians.	Muslims.	Others.	Total.
	Br.	N. Br.	Dep. Cl.				
I. ..	1,897	4,342	296	2,880	218	48	9,681
II. ..	613	1,027	38	20	2,876	—	4,574
III. ..	3,199	1,894	87	109	377	4	5,690
IV. ..	1,694	1,472	9	197	28	1	3,401
V. ..	909	2,502	142	8,263	59	17	11,985
VI. ..	307	2,940	248	1,351	140	8	4,991
VII. ..	153	1,892	71	675	1,244	14	3,949
VIII. ..	396	7,173	615	3,219	649	—	12,052
IX. ..	1,272	5,304	387	1,776	1,694	—	10,433
Town ..	10,440	28,456	1,943	18,510	7,315	92	66,756

Hindus :—		
Brahmans	.. 10,440	
Depressed Class	.. 1,943	
Non-Brahmans	.. 28,456	
		.. 40,839
Muslims		.. 7,315
Christians		.. 18,510
Others		.. 92
	Total	.. 66,756

The Brahmans (who are being urbanised more and more) form about 15·6% of the population, *the Presidency average being 2%*. There are various sub-castes among Brahmans such as the Shivallis, Deshastas, Saraswaths and Gaud Saraswaths, Havigas and others. The Havigas are supposed to have been the earliest to settle down in Mangalore. Tradition states that Mangalore was given over to the Havigas by Parasurama.

The bulk of the population is Hindu. They constitute about 61% of the population. The number of the Harijans is about the least of any town in South India. Christians form over 27%, the Muslims nearly 11%, and others less than 1% of the population. There has been a steady decline in the percentage of the Hindus and Muslims while the percentage of the Christians has steadily increased. In 1871 the Hindus, Christians and Muslims were in the ratio of 76 : 4 : 20 while in 1931 their ratio was 61 : 27 : 11, the Jesuits having come in 1879. The following table brings out the fact that the Muslims have stood stationary between 6 and 7 thousands while the two other communities have expanded steadily :

Year.	Hindus.	Christians.	Muslims.	Total.
1871	22,618	1,149	5,900	29,712
1881	18,590	7,568	5,896	32,099
1891	23,398	9,845	7,584	40,922
1901	25,312	11,604	7,149	44,108
1911	26,527	15,375	6,318	48,112
1921	31,194	16,602	6,002	53,877
1931	40,839	18,510	7,315	66,756

The movement of the population in recent years has been rather characteristic. A tendency to move away from the central Zone and occupy the Wards in the outer zone is strongly in evidence, as the following statistical table indicates.

Wards.	1901.	1911.	1921.	1931.
1. and 9. Kodiyalbail E. & W.	10,737	13,536	16,160	20,109
2. Golikatta	5,449	3,824	4,517	4,574
3. Central	5,502	4,569	5,029	5,690
4. Market	3,192	2,315	2,781	3,401
5. Court	5,686	8,560	9,928	11,985
6. Cantonment	4,021	3,747	4,196	4,991
7. Fort	3,923	3,119	2,750	3,949
8. Jeppu	5,598	8,742	8,516	12,052

From the above table it may be observed that the population has nearly doubled itself in the Kodialbail, Court, and Jeppu Wards in the past 30 years while the population of the other Wards has either decreased or remained stationary. This is probably due to the fact that the central wards are smaller in size, have a denser population but fewer houses and higher land values due to their commercial and industrial aspects; while the wards of the other zone have a thinner population, more extensive residential areas and cheaper land and more houses. These details are given in the table below :

Ward.	Area in Acres.	Population.	Density per acre.	Houses.
I.	576·13	9,681	16·8	1,304
II.	84·09	4,574	54·4	652
III.	103·06	5,690	55·2	757
IV.	94·21	3,401	36·1	450
V.	852·09	11,985	14·1	1,598
VI.	332·09	4,991	14·7	843
VII.	108·98	3,949	36·3	400
VIII.	680·36	12,052	17·7	1,729
IX.	516·10	10,433	20·2	1,452

Under these circumstances the municipality is considering the possibility of a northward extension of its boundaries.

The condition of education in Mangalore is above the average for the presidency. There is a larger number of educational institutions and through their efforts education is rapidly spreading among the people. In 1921 the percentage of literates to the total population was 21·7% while in 1931 it rose to nearly 33%. The actual number of literates in 1931 was 21,519 of whom 14,388 were males and 7,131 females.

The population has been classified as agricultural, industrial including trade and transport, and professional including arts and

religion. About 20% of the town population is dependent upon agriculture, over 55% on industry and less than 25% on professions. Over 10% of the people may be classed as poor.

The housing is rather inadequate. The increase in houses has not kept pace with the increase in population as the table below will illustrate :

Year	Houses	Population
1871	5,277	29,712
1881	6,876	32,099
1891	7,128	40,922
1901	7,441	44,108
1911	7,850	48,112
1921	8,450	53,877
1931	9,185	66,756

The housing is inadequate. The number of persons per 100 occupied houses is 727. In this respect it stands third in the Presidency as shown below: Madras 877 ; Rajamundry 793 ; Mangalore 727 ; Madura 723 ; and Vellore 709. Taking the first three cities the following table indicates the pressure of the population:

City	Max. for 10 houses.	Min. for 10 houses.	Proportion of wards with less than 60.	
Madras ..	128	44	3/30	10%
Rajahmundry ..	113	60	0/24	4%
Mangalore ..	81	58	1/9	12%

The quality of the houses has improved considerably within the last 60 years. The thatched houses were nearly 65% in 1871 but at the present day they are about 12%. The general type of the houses is fairly substantial in character and invariably roofed with Mangalore tiles. The climatic conditions require a type of roof that will easily allow the water to run off. The houses are usually built on high ground and have steeply sloping gables with roofs projecting about a yard beyond the walls.

The houses may be classified as Bungalow, pucka and katcha houses. The better class or pucka houses are built of laterite slabs and plastered with cement on the sides facing the monsoon winds. The katcha houses are built of mud and are usually plastered with lime and sand mortar. The poorer types of houses are built of mud and thatched. But these are becoming rarer in the city. The distribution of the houses in the various wards is

given above. Reinforced concrete buildings are becoming fashionble now.

In residential areas it is rather difficult to distinguish a house of one community from that of another. As a generalization it may be stated that the residential houses are built facing a direction practically perpendicular to the direction of the road and rather far away from it, to minimise the dust nuisance, have fairly wide verandahs with comparatively broad parapets and long and rather narrow doors and windows.

The business houses and shops are quite different in construction from the residential ones. They are usually built on either side of the main roads, have very wide doors and no windows at all. The verandah characteristic of residential houses is practically absent.

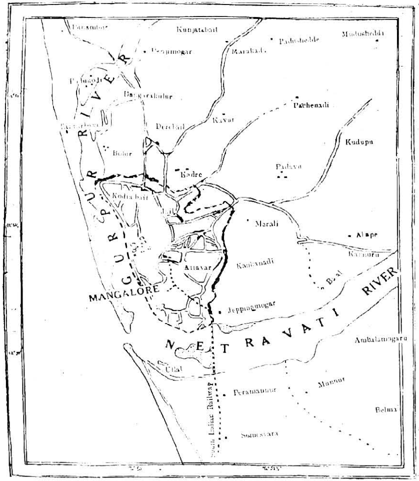
One other feature that may be mentioned about the houses is that the Mohammedan houses are rather poor in construction and can easily be distinquished from houses of other communities by their being closed to the view of the man on the street and their small high placed windows. This character of the Mohammedan houses is ascribable to their observance of the Purdah.

The mother tongue of the bulk of the people is Tulu. At least 70% of the people can speak and understand it; but the official language of the capital of Tulu Nad is Kanarese. The bulk of the Christians and all the Saraswaths and Gaud Saraswaths have Konkani as their mother tongue. Malayalam is the language of nearly 10% of the population but the bulk of the Malayalam-speaking people are the Moplahs who speak a corrupt dialect of Malayalam.

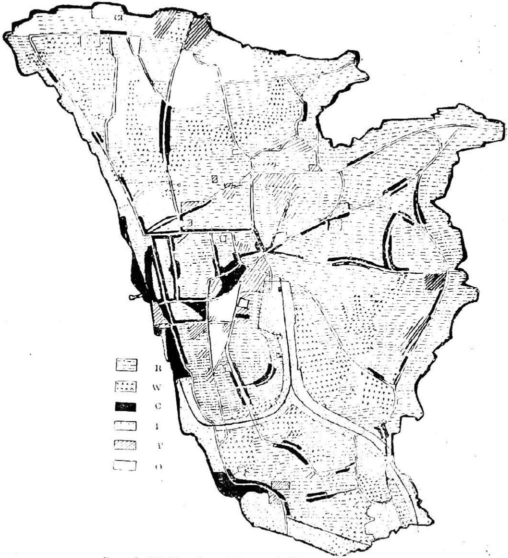
IV. OCCUPATIONS AND INDUSTRIES

The 1931 Census Report states that ' on the West Coast, towns have arisen at the more important crossings of lagoons and backwaters. The urban growth depends upon, industrial development and swifter means of communication. This description applies well to Mangalore which has developed a preponderatingly industrial aspect.

Agriculture was more important formerly than now. At present it engages only 20% of the population. The agricultural land which is about 25% of the total area is distributed in all the wards of the town. Rice is the principal cereal and two crops are



Mangalore and its Immediate Surroundings.



Land Utilization Map of Mangalore.
R. Residential; W. Wet Cultivation; C. Commercial and Business; I. Industrial and Railway; P. Public Buildings; O. Open Maidan.

usually reaped though three crops are not uncommon in wet lands where water is available. In areas where water is deficient, pulses are grown as dry season crops. Sugar cane is sometimes grown in rotation with paddy but very little of this is used in the manufacture of sugar, the cane being sold for chewing. Much grain is exported from the port but the bulk of this comes from other parts of the District.

Factories and other industrial establishments engage about 60% of the population. The principal factories in Mangalore are the tile factories which number over forty now. Of these 33 tile factories and 1 ceramic factory are situated in Ward 8 and 7 in Ward 9. The factories are located on the banks of the rivers and manufacture tiles, bricks, ornamental pillars, rails and other fancy articles besides drain pipes of various sizes and shapes. The factories employ over 2,500 people. The actual number of operatives in 1931 was 2871.

Tiles used to be manufactured in Mangalore and elsewhere even before the factories came into existence. Yet through the activities of the Basel Mission, Mangalore was the first to develop the mechanical manufacture of tiles on a large scale. The first factory was established by the Basel Mission in 1865 and the pattern of the tile was registered as a patent. Three years later, in 1868, an enterprising catholic established a factory under the name of A. Albuquerque & Sons. The number of factories went on increasing rapidly and by 1895 there were 11 factories, two owned by the B. E. M ; one by Morgan & Sons ; and eight by local Catholics of Mangalore. The industry was still on the ascent till recently when the number of factories has exceeded 40. But the general trade depression and slump in the commodity market, the local competition among the factories, and the competition abroad from Japan have all tended to paralyse the industry.

We have already seen that all the factories are situated on the river frontage, and with reason. The tiles are made from a peculiar kind of clay found higher up the Netravati and Gurpur rivers. The rivers are navigable and the raw material is found in close proximity to navigable waters Water transport of clay is a factor. The fuel is also a bulky commodity and comes from the southern taluks in boats. Not only are the raw materials bulky but also the manufactured articles are bulky and cannot stand heavy transport charges ; being liable to break they are best carried by water and can wait long for boats, being non-perishable. Moreover, the princi-

pal markets are the coastal cities of Karachi, Bombay, and Goa and the situation of the factories near rivers give easy river communication and steamer facilities to Bombay. All these causes have been fundamental in the centralization of the industry in these regions while the availability of skilled labour in these localities have acted as a secondary cause in the further concentration.

What are the advantages of the tiles manufactured by these factories ? The tiles are larger in size and as such more economical for roofing purposes. They are light and hard and can stand knocking about on trains and boats. It is these advantages of size, durability, strength, and lightness that have tended to establish these tiles to the exclusion of the old country-made tiles.

With the increase in the number of factories the prices have tended to fall. In 1895 first class tiles used to sell at Rs. 35 to Rs. 45 per 1,000, while the ridges used to sell at Rs. 80 per 1,000. The rates have declined steadily since then. The current price is Rs. 20 to Rs. 25 per 1,000. This barely covers the cost of manufacture. The following details give the approximate cost of production of 1,000 tiles.

Clay	.. Rs.	3	0	0	to Rs.	4	0	0
Fuel	.. Rs.	6	0	0	to Rs.	8	0	0
Making charges	.. Rs.	6	0	0				
Machine oil etc.	.. Rs.	1	0	0	to Rs.	2	0	0
Total cost of 1,000	.. Rs.	16	0	0	to Rs.	20	0	0

Of these only 75 to 80% will be first class tiles.

The above table indicates that the cost of production comes to between Rs. 16 and Rs. 20. The average outturn of a factory ranges from 9 to 10 lakhs in small factories, to 50 to 55 lakhs per year in larger ones. The factories usually work for 7 months in the year. It is possible to work the factories in the rainy season but the heavy demand for open drying space tends to limit the manufactures during the rainy reason. Moreover the tiles manufactured during the rainy season are supposed to be inferior to those prepared in the dry season.

Certain economies have recently been effected by changing the fuel from firewood to the cheaper cashewnut shells. This has been very successful in areas where cashew shells are available locally as at Jeppu. The tiles manufactured with this fuel do not in any way appear inferior to those manufactured with wood fuel. On the contrary, they acquire a brighter colour and better sound and are supposed to have a better demand. The costs of manufacture with

this fuel are estimated to be between Rs. 14 and Rs. 18 per thousand.

No glazed pottery is made here. The Commonwealth factory has manufactured glazed pottery in the past but the demand is lacking and as such this department of industry is not likely to receive much attention.

Owing to the large number of factories, Mangalore is pre-eminent among tile manufacturing towns and ranks first. The Mangalore production is far in excess of demand and though transport facilities are lacking, they still compete in foreign markets; for as the 1931 Census Report states 'the West Coast factories are reported to compete at a great disadvantage in the Penang and Singapore markets as it is impossible to get steamers to convey these shipments to the places.'

The Cashewnut Industry.—The tile industry is almost leaning on the cashewnut industry for success in foreign markets. The municipality has classified the roasting of cashew nuts as a dangerous and offensive industry and imposes certain restrictions on it. As a large volume of disagreeable and offensive smoke is emitted in the process of roasting, it is undesirable to have the roasting carried out in residential areas. The municipality by insistence on licences and other restrictions has confined the industry to the suburbs.

Cashewnut roasting was carried on as a home industry in Mangalore from early times. It assumed larger proportions in the last 15 years. The Census Report of 1931 states 'the production of cashew kernels is the chief industry of the West Coast, Mangalore being the chief centre.' This industry like the tile and coffee industry is centered on Mangalore.

The estimated total Indian Production of cashew-nuts is 300,000 bags of 140 lbs. each of which South Kanara produces between 70 and 80 thousand bags, while Malabar, Cochin, and Travancore produce an equal quantity some of which is imported into Mangalore. Goa and Bombay Presidency produce about 110,000 bags while the East Coast produces about 50,000 bags. The Mangalore factories alone require between 200 and 300 thousand bags. But on account of the presence of cashewnut-roasting factories and cottage industries of the same nature in the places of production, Mangalore does not get nearly enough of the Indian crop to meet her requirements. The deficit is made good by importing

nuts from East Africa into Mangalore between December and April when the Indian crop is exhausted. There are at present 6 factories located in Mangalore providing employment for 4,000 persons and the annual wages amount to Rs. 4½ lakhs. The kernels are exported to America and the European markets. The industry has no resting season ; and so, large quantities of kernel are railed to Cochin and other ports for shipment during the monsoon season when the port of Mangalore is closed. The special feature of the industry is that it requires cheap and delicate labour and as such is better fitted for feminine hands. The majority of the people employed are women. The labour difficulty in European countries will leave Mangalore secure in this industry which is bound to improve in future. The process of packing the kernel for export is kept as a secret.

The bye-products of the industry are growing in importance day by day. About 1930 Mr. Jeffreys, the manager of Messrs. Pierce, Leslie & Co., Ltd., invented a contrivance for the more efficient roasting of the nuts and the collection of the oil. The oil is reputed to contain a small percentage of iodine. It is largely used in the tile industry and as a cheap preservative for timber it can displace wood-oil. It is likely to be used more extensively in future. The cashewnut shells are, at present, more important than the oil. Originally used as a fuel in lime kilns, it has now come to be used as the main fuel in most of the tile factories. The more extensive use of these shells in tile factories in future will prop up the declining tile industry.

Coffee-Curing Industry.—Another industry which requires special attention is the coffee-curing industry. This is an old industry which is neither offensive and dangerous like the roasting of cashew-nuts nor so dependent upon water transport as the tile industry, and as such is located in various parts of the city. Before 1895, there were 3 large curing houses in Mangalore owned by Messrs. Morgan & Sons, Arbuthnot & Co., and A. J. Saldanha & Sons. At present there are 5 large and 10 small factories engaged in coffee curing employing over 2,000 hands. The factories are carrying on the work of peeling, winnowing, sizing, picking, and exporting coffee. The coffee season starts somewhere towards the beginning of November and continues till the end of April. During the season about 7,000 tons out of a total Indian production of about 18,000 tons are cured in the five factories and exported to England and the Continent. This like the other main industry,

the manufacture of tiles, is gradually declining on account of competition from rival factories in the places of production in Mysore.

In respect of labour employed, this industry is analogous to the cashewnut industry employing more women than men. One great advantage of the industry is that the husks supply the fuel for working the machinery. As extensive grounds are needed for picking and drying the coffee before it is ready for export, the industry has a tendency to be located in non-congested areas where cheap land is available. All the factories use steam engines.

Coffee has been holding a place of prime importance among the exports of Mangalore. Mangalore is the greatest coffee port of India and leads in this industry as well as in the tile and cashewnut industry. The main drawback here is that Mangalore factories are entirely dependent upon foreign supplies. None of the coffee exported grows in the town and Mangalore is, as it were, the workshop of the coffee estates of Coorg and Mysore.

In recent years, some small factories have been established in Chickamagalur and Mercara. These factories are rapidly capturing the business of the Mangalore curing houses. At the same time slow and uneconomical bullock cart transport is rapidly giving place to the cheaper and swifter motor transport so that the distance in days has diminished to about one-eighth. These two factors, swifter transport and closer factories, are working in opposite directions but the long-established reputation of the Mangalore firms and the still more potent factor of the ownership of several estates by Mangalorean planters still attract the bulk of the trade towards Mangalore. Under the present circumstances, it is not likely that Mangalore will lose her position as a coffee-curer in the near future. Under existing conditions she is bound to continue as a coffee port even after she loses her coffee-curing business.

The Weaving Industry.—Of the other industries, we shall consider briefly the weaving industry. South Kanara has been an important weaving centre from early times. The number of looms in Kanara exceeded 2,000 in 1931. Fly-shuttles are mostly used in the industry. The bulk of the industry is located in small villages outside the limits of the town. The thread is imported from Bombay and is usually dyed locally with German dyes. The industry employs about 1,600 hands. Sarees, towels, bed sheets, dhoties, lungis, and other articles are manufactured. The cloth is rather coarse but is much used on account of its strength and durability. The cloth manufactured is seldom exported but is generally absorbed in local consumption.

The Basel Mission, now the Commonwealth Hosiery Factory at Balmatta employs the Christian converts mainly. Large quantities of hosiery are manufactured and sent to their headquarters at Calicut. The St. Joseph's Orphanage at Jeppu is also having a weaving establishment where the orphans work on the looms. At present only Messrs. P. Machado & Sons of Kadri are using power looms. Most of the employees in weaving establishments are men.

The weavers are rather backward ; there are no co-operative societies among them. This backwardness according to the Census Report is due to (i) Ignorance, indifference, and character of the weavers ; (ii) Difficulty for disposal of finished products of non-standard quality ; (iii) The vested interests of the master weavers ; (iv) Indebtedness of the weavers ; (v) Weavers' unbusinesslike habits ; (vi) Rarity of men capable of running the simplest societies among the weavers. The industry is bound to benefit if worked on co-operative lines.

Fish-curing and allied industries used to be very important formerly but are unimportant to-day. About 400 to 500 tons of fish are exported annually while the imports amount to over 4,000 tons. The fish-curing industry is confined to the coastal tracts and the fishing castes live in small hamlets on the river banks on the outskirts of the town. They form about 2% of the population. Prior to 1928 large hauls used to be made of sardines and mackerel and a large number of presses was located all along the coast engaged in extracting oil from sardines. This oil was much used in the tile industry and was much in demand for jute batching, candle and soap-making. The guano makes an excellent manure and used to be sent to the coffee estates of Mysore. The fish oil industry has completely died out now owing to the uncertainty of the catch of sardines in recent years.

The minor industries are those connected with the coconut palm : oil-pressing, coir-making and toddy tapping and selling. Coir-making is a spare time industry and though it cannot be said to be restricted to any community, yet it is virtually a Moplah monopoly. A woman engaged in this industry can earn 3 annas a day. Rice beating and other allied industries engage nearly 500 people. These occupy the Rice Beaters Street. Basket making is mainly carried on by the Moplahs and Koragars. Sweetmeats preparation is the main industry of a large number of people who own coffee-houses. The coffee-houses employ over 500 people. Besides these, there is a large number earning their livelihood from dairies, bakeries, dhobikhanas, aerated-water factories tailoring and

such other occupations. Nearly 1000 people are employed at the docks.

The industrial and residential areas are given on the Land Utilization Map.

V. ROADS AND COMMUNICATIONS.

Mangalore is endowed by nature with means and materials for easy transport. Mangalore is most centrally situated on the coast of South Kanara. Its very position has made it the headquarters of the district and as a consequence of this there are main roads connecting Mangalore with the headquarters of the different taluks of the district and others across the passes in the Ghats connecting it with Bangalore, Mysore, Mercara and other places in Mysore and Coorg, so that Mangalore may be said to be located at a 'converging point of a fairly complete system of main roads of the taluk and the other countries that lie far inland.' It is said that 'five out of the seven well-traced through-passes in the Ghats converge on Mangalore.'

In the early development of road system, the town had a great advantage in having road material available in the hills on its outskirts. The roads seem to have evolved from slipshod building operations and do not give evidence of a conscious and systematic planning ideal. In the Central wards of the town, however, the planning of the roads has been done on rectangular lines and here, in spite of overcrowing of streets, the general appearance is beautiful and the final effect pleasing. The main roads radiate from the central area but are usually laid out in a circular course without much regard to architectural effect of developments on either side of these roads. There are a few beautiful avenues in Pentlandpet.

The town possesses 2·34 miles of Trunk Road and 51·02 miles of ordinary roads. The Wards 2, 7, and 4 are better provided with roads than others. The rather heavy road traffic has necessitated the widening of roads but this has been found very expensive due to want of proper planning. Granite metal is used in road construction specially on the Trunk and main roads. Laterite metal continues to be used on minor roads. Red laterite dust has been one of the great nuisances of the town in the past. This is, however, mitigated by the use of granite metal and by watering the roads with motor lorries.

The roads are usually flat or gently sloping. Still in certain areas especially, the roads approaching the central area have steep

gradients varying from 1 in 12 to 1 in 35. The roads with steep gradients are the Nandigudda Road in Attavar and the Falnir Road at the Falnir Junction with gradients of 1 in 22 and 1 in 18 respectively. The Balmatta Road near Steven & Sona with 1 in 30 ; Court Hill Road near S. N. Katre with 1 in 12 and Kankanadi Road near Mr. J. A. Saldanha's house with 1 in 20.

The chief centres of vehicular traffic are Hampankatta, the Railway Station Road, Goods Station Road, the Port Bunder near Customs Office and Old Shedigudda Junction. Hampankatta is the starting place for buses to all places in the district and beyond the Ghats. The major portion of the town streets is lit electrically.

Since, January 1937, the municipality has started the asphalting of the main roads This is expected to be complete by the end of the year 1938-39. It is expected that these roads will be closed for bullock carts bringing down laterite slabs from the Padav in the north-east.

The City Bus Service, established in May 1937 is running 8 buses on four different routes. All the buses start from Hampankatta and go to Bizai, Bendore, Kadre, Kankanadi, Bolar Jeppu and Bunder.

The rivers are navigable for a considerable distance from Mangalore. There are two main routes along the two rivers :—1. From Mangalore to Pane-Mangalore and Buntwal a distance of 18 miles and 2. Mangalore to Gurpur a distance of 10 miles. On their downward trip the boats carry large cargoes of rice straw, clay, and pulses for the Mangalore market. There is not enough return cargo and the boats therefore take passengers on their return. This is a cheap mode of communication but suffers under the great disadvantage of being very slow and of having to wait for wind and tide.

Mangalore is the terminus of the South Indian Railway and is thereby linked to Madras. But the railways are not important for inland transport.

VI. THE PORT AND PORT FACILITIES

Mangalore has featured as a port of the West Coast from early times. Mangalore is a regular port of call for vessels of the B.I.

Steam Navigation Company ; and steamers of the Bombay Steam Navigation Company ply regularly between Mangalore and Bombay twice weekly in the dry weather season between September and May.

"The best anchorage, the roadstead, is in about 5 fathoms, sand and mud, with the lighthouse bearing 050°, distant 1¾ miles. miles. This anchorage is subject to constant alteration."

"The harbour consists of one north quay 1,095 feet with a depth of 3 feet L.W.O.S. and a pier built of iron girders and wooden decking 182 feet by 44 feet depth, about 5 feet L.W.O.S. alongside. One new south quay has also been constructed. There are no docks. There are two warehouses one landing and shipping with capacity 42,900 c.ft. and one Customs 28,700 c.ft."

The port, at present is an open roadstead. Steamers anchor about 2 miles off the shore in 5 to 6 fathoms of water. Small native vessels enter the backwater at all states of the tide and anchor in the inner anchorage. Vessels of 7 to 11 ft. draft enter the harbour at high water. The bar lies about 1 mile from the mouth of the rivers and carries from 7 to 9 ft. water L.W.O.S. The bar is impassable during the 3 monsoon months of June, July, and August.

The port carries on both a coasting and foreign trade. Among the foreign imports are kerosene oil, metal manufactures stationery, hardware, provisions, oilman-stores, machinery, soaps, liquors etc., from the United Kingdom ; liquors from France, wines from Spain and Portugal ; Oilman-stores from Switzerland ; hardware from Holland, Belgium, and Germany ; wet dates from Arabia and Persian Gulf Ports ; onions from Goa. The coastwise imports are cotton yarn and twist, piece goods, grains, flour, etc., from Bombay ; and coconuts, gingelly oil and poonac from Cochin by native craft.

The foreign exports are tiles, fish, fish manure, oil and guano to Ceylon ; coffee, spices, and cashew kernels to the United Kingdom, France, Germany and the Norwegian Ports ; tiles and rice to Goa, Arabia, and the Persian Gulf Ports ; coffee to the Australasian and Persian Gulf Ports ; and cashewnuts to America. Tiles, coffee, coconuts, copra, rice, betelnuts and spices enter into the coastwise trade with Bombay and Kathiawar Ports.

The following table gives the value of the imports and exports of the port :—

The total value of the trade of Mangalore in lakhs of Rs.

Year.	Foreign Trade		Coasting Trade.		Total Trade.	
	Imports.	Exports.	Imports.	Exports.	Imports.	Exports.
1931-32	7·30	100·06	72·40	62·75	79·70	162·81
1932-33	8·81	102·78	82·45	67·24	91·26	170·01
1933-34	14·38	107·96	82·45	67·02	94·54	174·98
1934-35	17·37	91·93	79·47	84·63	96·84	176·57
1935-36	21·90	116·55	77·13	73·41	99·03	189·96

With increasing coasting and foreign trade Mangalore has come to be the third greatest port of the West Coast of the Madras Presidency carrying on about 3% of its trade. It is preceded only by Cochin and Calicut which carry on thrice and twice as much trade respectively.

VII. CONCLUSION

We have seen that Mangalore is a great manufacturing and industrial town being the chief seat of three of the main secondary industries of the Presidency, tiles, cashew-nuts, and coffee. It is a commercial and seaport town of considerable importance and has been for a long time a 'flourishing emporium.' The Port is an open roadstead ; as such navigation is not easy. The approaching monsoon is usually heralded by a practically daily change of the navigable channel, and shifting sandbanks obstructing the bar. Pilotage is obligatory at this season and no ship of over 100 tons can enter the inner anchorage unassisted by a pilot under orders of the Port Officer. The port facilities are therefore neither so enticing nor so favourable as to offset the disadvantages of an unprotected artificial port. Under existing conditions the potentialities of the port are not great.

In early times it was a commercial rather than a political capital. The Portuguese settlemnent gave it added importance while the occupation by Hyder Ali and Tippu made it a natural outlet for the products of Mysore. The British followed the path chalked out by their predecessors. The political dependence of Mysore upon the British tended to maintain the goodwill of Mysore towards Mangalore which had been already established by Tippu. The establishment of the District Headquarters, the roads radiating in all directions, the railway facilities, the establishment of factories, all these have been responsible for the develop-

ment of Manglore as a port. The disadvantages of the port as we have seen are great and it is not likely that Mangalore will escape the fate of ports where geographic momentum is in evidence.

Mangalore cannot for long maintain her present position as an important port. She has several rivals further north whose potentialities are enormous. Malpe in the Udipi Taluk is one such. Though not as centrally placed as Mangalore with regard to the district, Malpe possesses the great advantage of a protected anchorage. The islands off the coast enclose a basin of shallow and relatively calm water about 1½ miles wide. The bar is only 6 ft. deep so that ships have to stand far out. The possibilities of improving the port have been considered more than once, but the rather poor means of inland communication deserve attention before any scheme for the improvement of the port of Malpe can be put into execution. Once established, the port of Malpe is sure to attract a considerable part of the trade of Mangalore.

The development of Cochin Harbour has also been detrimental to the interests of Mangalore as the comparison of the figures for the volume of trade for the years prior and subsequent to 1930, the year of the opening of the Cochin Harbour will indicate.

The value of the trade of Mangalore in Laks of Rupees.

Years.	Foreign.	Coasting.	Total.
1928-29	170·32	166·42	336·74
1930-31	190·11	163·33	353·44
1931-32	107·36	135·15	242·51
1933-34	122·34	147·18	269·52
1935-36	138·45	150·54	288·99

A brief examination of the above table reveals a considerable diminution in both the coasting and foreign trade of the port. Though the above decrease is partly ascribable to the general economic and trade depression, it remains an undeniable fact that Cochin has affected Mangalore trade rather adversly. The shippers are not usually in a hurry to ship their cargoes by the last ships as they can easily avail themselves of comparatively safer shipments by railing their goods to Cochin.

We have so far considered briefly the actual and possible effects on the trade of Mangalore arising out of competition from rival ports. Mangalore has a fairly rich and extensive hinterland comprising S. Kanara, Coorg and Mysore. A large part of this

hinterland is included in the progressive Native State of Mysore. The State Government wanted to acquire a port itself somewhere in the northern taluks of South Kanara, as at Bhatkal but the negotiations have not been successful so far. The acquisition of a port by Mysore will probably divert the bulk of the coffee trade from Mangalore.

Mangalore has already realized the significance of these moves and with a view to forestalling them, the port authorities have decided upon the dredging of the rivers. A suction dredger has been imported and a drydock is being built about 150 yards to the south-east of the Port Office. These improvements have cost about 2½ lakhs of rupees. Dredging operations have already been commenced with a view to rendering the channel navigable at all states of the tide and at the same time to reclaim a fairly large area near the goods station. These operations are sure to improve the shipping facilities and the port is bound to profit by them.

Whatever the future of the port may be, Mangalore will not lose its industrial and commercial character. No doubt she might find it hard to mainain her position as the third port of the west coast of the Madras Presidency. Her salvation lies in a growing specialization of her industries for which nature and nurture have fitted her alike. Let us hope and wish that she may imitate her British and American predecessors in this line by specialization and turn her very disadvantages to good account.

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The Trade of the Madras Port

Part I—Foreign Trade

BY

K. Ramamurthy, M.A., Dip. in Geo.

Madras Port is entirely the creation of Man. Historical necessities made the English obtain from the Hindu Vizianagar Emperor the present site of Madras, in rivalry with the Portuguese at San Thome (the ancient sea-port of Mylapur) three miles to the South and the Dutch at Pulicat, thirty miles to the North. At those centres, their factors had established foreign trade, buying the produce of the looms of the industrious hinterland-villages. It was a water-logging area, by the mouths of the Cooum; the coast is still a surf-beaten sandy shore subject to swells. But the ships would lie off at the Madras Roads, the actual landing being effected by masula boats which are specially evolved for surf-riding. *The goods were piled on the sand and carried in gradually and stored in the company's godowns after inspection by the Sea-customer. It was in 1794 that the Sea Customs Office was moved to its present site because there was more space there and goods began to be landed on the strip of beach opposite the Custom House instead of at the Fort; but they were still brought ashore by Masula boats, which did good business. The loss in this way between ship and shore was estimated at 90% of the loss on the whole voyage and at 20% of the trade profits. In 1877, at the suggestion of an Engineer, Mr. Parkes, a harbour was constructed, formed by a pair of arms, 3,000 feet apart, stretching out seawards parallel to one another for a length of about 3,000 feet, and then curving round towards each other so as to leave an entrance of 515 ft. on the east side. The conditions prevailing until Sir Francis Spring came on the scene are described by him:—

"There was full scope for the swell to roll in nearly all the year round, which made the working of vessels slow, difficult and dangerous during many months of the year. The 5-fathom line was about half a mile from the shore forming the west side of the harbour, which consisted of a long flat sandy slope, with surf roll-

* Vide G. G. Armstrong: History and Development of Madras Harbour, M.G.J., Vol. V, No 1.

ing in on it but little less violently than outside. There was no place for small craft to lie in shelter in dangerous weather, and though a few dozen 10-ton lighters had come into existence alongside of the old surf boats, they were constantly breaking loose during May and November, and, once broken from their moorings, nothing could save them from work. Needless to say, this greatly discouraged the provision by capitalists of an adequate tonnage of lighters. Between high water mark and the streets of the town of Madras there were to be found a few confused and unregulated railway sidings and two or three exiguous sheds. The beach was to be seen at all times littered with timber, coal, railway materials, general cargo, machinery, liquors, etc., all in dire confusion. Every packet of dutiable goods landed along the beach, unless too big to be so handled, was obliged to be carried on men's heads to the Government Custom House across the road, while goods arriving over the old screw-pile pier had to be pushed into the same Custom House on lorries. The entire dutiable trade of Madras had to pass in, and the empty lorries to pass out, through one 10-feet Custom House gateway. The result was that it was no uncommon thing for a consignee, not to get his packages under several weeks and even months. Machinery and railway packages used to be piled up in stacks, sometimes three or four deep, on the beach, and it was constantly happening that before the cargo of one vessel could be delivered to waiting consignees, that of another had perforce, for want of sidings, to be dumped on top of it. In fact the arrangements were about as bad as they could possibly be."

Sir Francis Spring put himself to the task of reconstructing the harbour on its present lines. The entrance in the east had got silted up in the course of several years since the completion of the first works and so a 400-feet entrance on the north-east was opened in 1909 and the old entrance closed.

THE HARBOUR AS IT IS NOW[1]

The present harbour is formed by two concrete walls projecting into the sea so as to enclose a space of about 200 acres with an entrance from the north-east. It can accommodate 14 vessels drawing up to 31 ft. 6 in. There are seven wharves five of which are well equipped on modern lines for the rapid discharge and loading of cargo. Even at the low tide, there would be a depth of 26 to 30 ft. of water by the side of the wharves. There are also seven mooring berths inside the harbour, and one berth outside, protected by the north arm of the harbour. Two tugs are availa-

ble at all hours for assisting in mooring and unmooring of vessels. Landing and shipping of cargo for vessels at moorings is effected by lighters of 20 to 100 tons capacity. The western face of the harbour has been quayed so that the ships can now lie alongside and work cargo direct out of and into the sheds. There are three other quays, connected up by rail with all parts of the harbour for the discharge of case oil, and petrol, coal, horses and cattle. Oil from tank steamers is pumped ashore direct through the pipes into the merchant's installations. The west quay is provided with modern hydraulic and electric cranes, capable of working directly into, and out of, the holds of vessels lying alongside, besides several smaller cranes.

The warehouse accommodation covers over 16 acres and includes five transit sheds for the storage of goods in transit between ship and shore, three warehouses with flat roofs and three sheds with asbestos cement corrugated sheet roofing, for the convenience of shippers dealing in groundnuts and other products which ordinarily need to be cleaned, dried, and graded before shipment. There is a nine acre boat basin which gives necessary protection to all small craft in bad weather. This boat basin also contains a slip way for the repair of vessels up to 900 tons. An area has also been reserved in which smaller boats and barges can be built. There is a two acre timber pond with small jetties and cranes together with all the facilities for handling timber for which there is a large storage area adjacent. All sheds and quays are adequately served by railway sidings so that cargo may be discharged into or out of railway wagons directly by steamers.

ADMINISTRATION AND FINANCE OF THE PORT[3]

The affairs of the Port are administered under the Madras Port Trust Act, (1905) by the Madras Port Trust Board. The revenue receipts for the year 1936-37 amounted to Rs. 30,40,918. The gross expenditure amounted to Rs. 31,66,500 but the actual working expenses amounted to 56·5 per cent only, of the income, the rest being applied to interest, sinking funds, and capital charges. The income is derived from the harbour dues levied on export and import goods at varying rates for various kinds of goods.

MADRAS PORT IN COMPARISON WITH OTHER PORTS IN INDIA

There are six major Ports in India viz., Calcutta, Bombay, Karachi, Madras, Cochin and Vizagapatam. The first three Ports

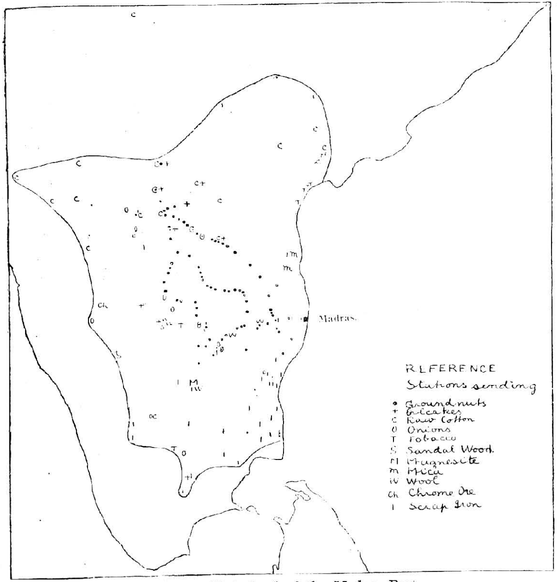
almost monopolise the trade pertaining to those parts of India, which cannot be said of the three Ports of South India. The hinterlands of Bombay and Calcutta are very rich for purposes of export trade, while the possibilities of Karachi are great on account of the Sukkur Barrage scheme in Sind. The hinterland of Madras is comparatively poor.

MADRAS PORT AMONG THE PORTS OF THE PRESIDENCY

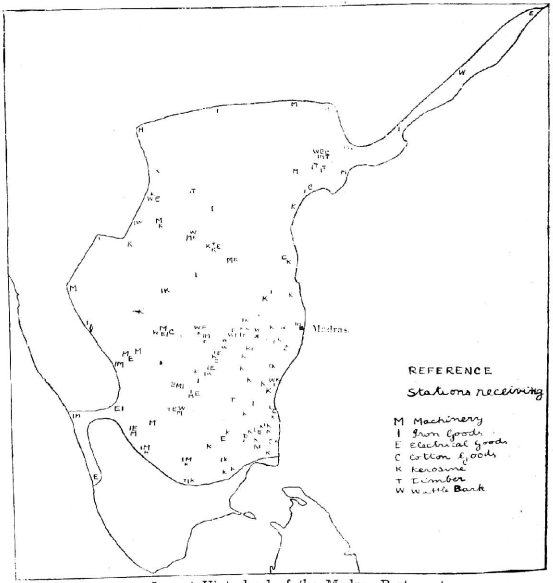
The share of the Madras Port out of the total foreign trade of the whole Presidency in 1936-37 is 38·7% while that of the other Ports are as follows :—

Cochin	..	16·5 per cent
Tuticorin	..	10·4 ,, ,,
Calicut	..	7·2 ,, ,,
Coconada	..	5·7 ,, ,,
Mangalore	..	3·1 ,, ,,
Cuddalore	..	2·9 ,, ,,
Vizagapatam	..	2·5 ,, ,,
Dhanushkodi	..	2·2 ,, ,,
Negapatam	..	2·0 ,, ,,
Other Ports	..	8·8 ,, ,,

Madras is the head of the railway system of South India. Cochin has the advantage of the system of break-waters running parallel to the coast which affords cheap transport and excellent waterways connecting several places of importance. It has a rich hinterland especially in tea, rubber and coir. It is nearer the West and its excellent natural harbour is being developed into one of the best in India. As for Vizag, it is some years since the harbour works have been completed on modern lines. The opening of the Vizianagaram—Raipur line in 1932 has considerably reduced the distance to the Central Provinces markets ; and as a result of it, a vast area in the Central Provinces which is rich in manganese, cotton and oilseeds, will be served by this port.[1] It is, however, seen from the figures that the expected increase in trade has not as yet been realised, unlike Cochin. The other Ports are not well equipped but they have a considerable share of trade, especially in exports. Tuticorin has been having a brisk export trade in raw cotton (of Tinnevelly District) and tea, and receiving grain, pulse and cotton piece goods required for the southern districts. Part of this trade may hereafter be diverted to Cochin on account of the superior facilities of that Port. Calicut and Mangalore are noted for export trade in coffee, tea and coir. Cocanada ranks fifth in the volume



Export Hinterland of the Madras Port.



Import Hinterland of the Madras Port.

of trade of the Presidency as seen above, in spite of its lack of harbour facilities. It is connected with a good inland canal system which serves well for export of groundnuts and tobacco through cargo boats, and it has the advantage of long-established firms of merchants.

HINTERLAND OF MADRAS PORT

The hinterland of Madras Port has varied in course of time. From embracing the whole Presidency (including Mysore) it has shrunk to tracts between Masulipatam and Negapatam on the East; and on the West, districts including Coimbatore and Mysore State. The growth of minor ports about twelve in number on the East and the West coast and the rise of two major ports, Cochin and Vizagapatam, have affected seriously the development of Madras Port. They are bound to affect it more and more with time; for, they are developing their own hinterlands offering merchants the advantages of shorter land-carriage and proximity to the sea; but there is the old momentum of Business Houses in Madras and the settled lines of trade-ways change only very slowly.

A feature of the Port of Madras has been that imports exceed exports. While the Madras Port shares 73% of imports of the Presidency, it has only 36% of the exports (1936-37). From abroad, there come *finished* goods which have to be handled with care, for which Madras is best equipped; while the exports are of raw produce which can be handled in bulk and laden through cargo-boats into ships lying at any minor roadsteads, cutting the costs of land-carriage as much as possible. This is why the import hinterland includes even some parts of the West Coast and the Northern Circars, though adequately served by other ports for export purposes. The case is otherwise with Calcutta, Bombay and Karachi, where most goods pass either way through them only. A second reason is that the imports consisting of highly finished articles could stand better the cost of long-distance transport before reaching their destination from the Port.

Another feature is that while the variety of goods in the export is small being but the special commercial commodities of the hinterland, the imports consist of all the multifarious finished and manufactured articles to satisfy the needs of the whole country.

IMPORTS

The following table gives an idea of the main articles of imports in 1936-37 with particulars in relation to the value of the imports of the Presidency and of the whole of India :

(Figures are in lakhs of rupees)

Commodity.	Import at the Port.	Imports of the Prescy.	Imports of India.	Percentage of the Port's to Presy's.	Percentage of the Port's to India's	Percentage of the Port's to total foreign imports of Port
Machinery & Mill Work ..	178·31	220·23	1413·94	80·97	12·61	15·99
Cotton Textiles ..	165·87	192·04	2333·02	86·40	7·11	14·88
Metals & Ores ..	75·26	106·69	968·70	70·52	7·77	6·75
Vehicles ..	73·53	78·15	657·78	94·08	11·18	6·60
Oils ..	58·62	115·55	725·27	50·70	8·08	5·26
Instruments apparatus and appliances ..	55·93	59·46	519·14	94·06	10·77	5·02
Dyeing and tanning substances ..	43·86	51·23	301·34	85·61	14·55	3·93
Rubber ..	37·22	41·16	213·30	90·43	17·45	3·34
Provisions and Oilman Stores ..	36·97	44·53	320·22	83·01	11·54	3·32
Paper & Pasteboard ..	31·20	41·13	281·68	75·88	11·08	2·80
Drugs ..	30·55	32·53	207·02	93·91	14·76	2·74
Hardware ..	28·72	35·92	289·35	79·97	9·92	2·58
Chemicals ..	28·63	38·89	272·19	73·64	10·52	2·57
Total imports from foreign countries ..	1114·50	1526·58	12524·28	73·00	8·90	100

To discuss the various imports in order of importance :—

Machinery and Millwork: It is seen from the figures for 1936-37 that four-fifths of the imports of the machinery and millwork of the Presidency or one-eighth of the whole of India is imported in the Madras Port. It forms 16% of the total foreign imports of the Port and forms the largest single item at present. They are tabulated as follows :—

	1936-37 Lakhs of Rs.
Railway locomotives	.. 17·94
Prime movers (other than electrical)	.. 33·40
Electrical machinery	.. 64·67
Textile machinery	.. 40·43
Sugar machinery	.. 3·43
Other machinery	.. 18·44
Total	.. 178·31

A comparison of the figures for the past ten years would show that there has been a steady increase in the value of these imports. 'The increase was due to the initiation of several electrical schemes in the different parts of the Presidency, the erection of textile mills and heavy imports of the Railway locomotives and parts.'[2] An import duty of 10% is imposed on the machinery as a revenue measure.

Cotton Textiles: Next to machinery and millwork, cotton textiles head the import list in 1936-37. Before this year, its imports exceeded that of machinery and mill-work. In 1936-37 it forms 15% of the total foreign imports. Of the total of cotton textiles valued at Rs. 165·87 lakhs imported at the port, raw cotton accounts for Rs. 19·06 lakhs, twist and yarn Rs. 17·08 lakhs, and cotton piece goods Rs. 78·32 lakhs.

Raw Cotton: Though the hinterland produces large quantities of raw cotton which are also exported to foreign countries in large quantities after satisfying the demand of the local mills, it suffers from the disadvantage that its staple length is only 7/8″. For the manufature of finer cloths by the local mills, the Egyptian long stapled variety has to be imported. Formerly these finer cloths came entirely from foreign countries mostly from Lancashire, but

now with the erection of numerous new textile mills the long stapled cotton came to be imported in gradually increasing quantities beginning from the year 1930-31 and increasing up to 1709 tons in 1936-37. Of this 1506 is from Egypt. In future even this import can be gradually displaced by the internal production of cotton of finer quality such as the Cambodia. The irrigation developments in Sind would make it one of the great future sources of long stapled cotton and Madras Port could advantageously import Sind cotton from Karachi instead of Egyptian cotton.

Twist and Yarn: The total of twist and yarn imports amounts to Rs. 69·47 lakhs. More than half the value comes from the United Kingdom and more than a quarter from Japan and a sixth from China (1936-37).

This excess from the United Kingdom may be probably due to discrimination in its favour with regard to import duty, which is 5% in the case of British and 6¼% in the case of non-British. All this import is absorbed by the handloom weaving industry, which is fairly widespread throughout this Presidency. Local mill yarn is displacing foreign yarn in increasingly large quantities, the effects of which may be felt in the import trade in this, in future. We have also to take into account the goods brought by coasting steamers and railway which are carried on a large scale but for which figures are not available.

Cotton Manufactures: The imports of cotton manufactures in 1936-37 at this Port amounts to Rs. 86·30 lakhs out of which cotton piece goods are valued at 78·32 lakhs.

IMPORT OF COTTON PIECE GOODS IN 1936-37

(In lakhs of Rupees).

	Coloured Goods.	White (bleached)	Greys unbleached.	Total.
United Kingdom ..	22·225	26·804	6·573	55·60
Japan	5·345	0·763	14·934	21·04
Switzerland ..	0·013	1·295	..	1·31
Other countries ..	0·058	0·305	..	0·363
Total ..	27·64	29·17	21·51	78·32

It is seen from the above that the United Kingdom accounts for 71% and Japan 26% of the import of piece goods. Japan scores over United Kingdom in the matter of import of unbleached

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greys. A comparison of the figures for the imports during the past 10 years shows that there has been a marked decline in the import of piece goods. Taking 1927-28 as basal year, the index numbers for the decade ending in 1936-37 are as follows :—100, 119, 140, 79, 55, 76, 58, 57, 50, 38. This decline may be also due to the rapid progress made by the Indian Mills. The cotton textile industry in India has also the benefit of an import duty of 25% for British and 31¼% for non-British goods. The decline may also be accelerated on account of further increase in production in our own Presidency, by the erection of new mills in South India. But the local consumption can be gauged only by the inclusion of Coasting Trade and Railway figures for which data are lacking. The help given to the handloom industry ; in however small a measure, by the Government, also conduces to the same result. It has also to be remembered that there is a considerable volume of export of Indian piece goods to Foreign Countries. This is dealt with later on under exports.

Metals : About three-fourth of the metal imported into the Presidency from foreign countries is landed at the Madras Port. The percentages of the several metals imported in 1936-37 are as follows :—

Iron and steel ..	46
Brass ..	19
Copper ..	11
Tin ..	5
Alluminium ..	5
Lead ..	1
Other metals ..	13
Total ..	100

The United Kingdom is the chief supplier of iron and steel and is followed by Belgium, Germany, Sweden, Japan and France in order of importance. The import of the metals has considerably diminished during the past decade, the imports for 1936-37 being a fourth of the imports for 1927-28. The decline is attributed to the increase in prices consequent on the large demand in the continental countries on account of the re-armament and considerable overstock in the country itself in former years.[2]

Vehicles: The imports of vehicles in 1936-37 at the port are of the value of Rs. 73·53 lakhs and forms 94·08% of the imports of the Presidency. This heavy share of the port in the trade of the Presidency is, as stated above, due to the high degree of efficiency of the modern cranes loading directly into the Railway truck. The comparatively high rate of harbour dues for Motor cars varying from Rs. 12 to Rs. 50 per car according to value, is not at all felt as a burden on account of the great facilities in the Port. About 1500 motor cars are being imported at the port annually. Out of this United Kingdom sends slightly more than half the number. In spite of the high tariff duty for non-Empire cars, U.S.A. is able to send more than a fifth of the number.

The Cycles imported in the Madras Port are of the value of Rs. 8·48 lakhs. Almost the whole of this (valued at Rs. 8·34 lakhs) comes from the United Kingdom. The Railway carriages account for Rs. 4·40 lakhs, three-fourth of which come from the United Kingdom.

Oil: The share of Madras Port in the total import trade of the Presidency does not fall below 70 per cent in major items; but the share in the major item of oil is as low as 50·70 per cent; for, the oil-tanker can discharge oil easily at any port equipped with tanks and pipe lines.

Fuel oils come from the Dutch Borneo and Sumatra. Of the total quantity of Kerosine coming from places other than Burma, 4,364 tons come from Batoum (Russia) and 10,209 tons from Palambang (Sumatra).[3]

Instruments, Apparatus, and Appliances: As the result of several electrical schemes which have been initiated or are under completion, the imports under this heading are very heavy.[1] There has been a steady rise of imports under this item during the last decade, as seen from the following Index numbers for that decade ending with 1936-37.

100 125 141 148 120 145 132 152 151 210.

The value of the import in 1936-37 is Rs. 55·93 lakhs and forms 94·06% of the imports of the Presidency. This high percentage share is exceeded only by the percentage share in vehicles. The reason for this may be the same as in the case of vehicles.

Dyeing and Tanning Substances: The imports under this item forms 14·55% of the imports of the whole of India under that

item in 1936-37, a higher percentage than in any other single commodity. This is due to the tanning barks imported from South Africa for the Madras Tanning Industry.

Rubber: Rubber imports consist mostly of rubber tyres and tubes for vehicles. Pneumatic motor tyres from United Kingdom and Germany account for Rs. 21·66 lakhs and Rs. 3·84 respectively out of Rs. 37·22 lakhs value of the rubber imports in 1936-37. Travancore and Cochin rubber industry may try to capture some of this in future.

Provisions and Oilman Stores: The imports under this item amounts to Rs. 36·97 lakhs in 1936-37 of which biscuits and cakes form Rs. 5·45 lakhs and condensed milk 5·85 lakhs mostly from the United Kingdom, which sent Rs. 5·27 lakhs worth of biscuits and cakes and Rs. 4·34 lakhs of condensed milk.

Paper and Pasteboard: Paper accounts for Rs. 28·46 lakhs. The import of old newspapers for package purposes are included under this heading and amount to Rs. 3·95 lakhs. The bulk of our supply of paper is however got from Bengal Paper Mills.

Drugs: Drugs are supplied from abroad chiefly from Great Britain, Germany and U.S.A. without any local competition and run to the tune of Rs. 30·55 lakhs.

Silk: Silk imports in 1936-37 amount to Rs. 19·90 lakhs of which raw silk amounts to Rs. 13·83 lakhs. Japan alone sends to Rs. 12·02 lakhs of raw silk and the bulk of the silk yarn and manufactures. Although Mysore is the largest producer of natural silk in India, and there is also the protective duty of 25% ad valorem on natural silk plus 14 annas per lb., Mysore, due to lack of scientific handling, does not stand up to Japan.

Artificial Silk: Of the total of artificial silk imports of the value of Rs. 19·49 lakhs the yarn accounts for Rs. 14·65 lakhs and piece goods Rs. 3·99 lakhs. Japan supplies Rs. 14·09 lakhs value of yarn and Rs. 3·70 value of piece goods. The high import duty of 50% is not having the effect of reducing the imports to any extent.

Other Imports: The values of the other imports are given below:

	Lakhs of Rs.
Hardware	28·72
Chemicals	28·63
Manures	21·37
Tobacco	19·8
Glass and Glassware	15·37
Paints	8·03
Toilets	6·92
Spices	5·92
Wood and Timber	5·77
Grain, pulse and flour	4·24
Soap	3·58

Hardware comes from United Kingdom, Germany and U.S.A.; Camphor which is included under chemicals comes mostly from Japan. As regards wood and timber it has to be noted that the above figures do not include Rangoon teakwood which is imported in large quantities for building purposes, as such import is classed as coasting trade. The import of Rangoon teakwood amounts to 18,932 tons in 1936-37. For the same reason, the figures for Grain, pulse and flour also do not include the Burma rice.

SOME GENERAL TRENDS OF IMPORT TRADE

Classifying Import Goods as Productive and Consumptional and Transport Goods, the relative values of these over the last decade is set forth in the following Table.

Item.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.
IMPORTS OF PRODUCTION GOODS :—										
Machinery ..	100	137	140	117	68	59	80	92	97	122
Instruments ..	100	125	141	148	120	145	132	152	151	210
Dyes etc. ..	100	136	115	99	107	104	99	112	92	111
Chemicals ..	100	101	101	98	108	117	120	113	118	107
Manure ..	100	258	421	273	122	283	220	291	308	267
Average of production goods ..	100	151	184	147	105	142	130	152	153	163
CONSUMPTION GOODS:—										
Cotton goods ..	100	119	140	79	55	76	58	57	50	38
Metals ..	100	86	78	55	33	35	33	36	32	25
Provisions ..	100	126	129	124	96	72	67	71	77	74
Paper, etc. ..	100	123	129	111	92	87	86	85	100	81
Liquors ..	100	109	123	112	77	78	80	80	78	70
Tobacco ..	100	147	138	89	71	80	80	72	63	62
Artificial Silk ..	100	153	170	202	205	258	157	179	107	107
Grain etc. ..	100	221	27	13	27	36	58	172	36	12
Sugar ..	100	138	175	95	66	31	29	13	9	less than 1
Average of consumption goods ..	100	133	123	98	82	85	75	87	66	59
TRANSPORT GOODS :—										
Vehicles ..	100	140	128	92	45	40	57	68	66	67
Oils ..	100	123	126	112	106	91	65	60	70	58
Rubber ..	100	115	114	97	79	71	74	72	72	89
Average of Transport Goods ..	100	126	123	97	77	67	65	67	69	71

These index numbers show that there is a steady diminution in the import of consumption goods, while there is a steady increase in that of the production goods, which is indicative of the rapid progress in the industrialisation of the country. This has been already indicated while considering the imports under machinery and millwork and cotton textiles, and instruments. The most remarkable feature is the rapid dwindling of the sugar imports during the past decade. In 1927-28 they were worth Rs. 55·79 lakhs; in 1929-30, Rs. 97·35 lakhs; but in 1936-37 only worth Rs. 30,000, the country becoming self-supporting in sugar production.

EXPORTS

While a large number of items have had to be considered under imports, the export trade consists mainly of a few main items, viz.,

hides and skins, groundnuts, raw cotton, and cotton manufactures, which account for nine-tenths of the entire export trade. This feature has been already explained. The value of trade in the various items of exports is given below.

EXPORTS IN 1936-37 :—

Commodity.	Exports at the Port.	Exports from the Presy.	Exports from India.	Percentage of the Port's to the Presy's.	Percentage of the Port's to India's.	Percentage of the Port's to the Total Foreign Exports of the Port.
Leather ..	674·80	675·22	736·37	99·95	91·64	51·47
Hides and Skins raw ..	33·58	34·50	443·40	97·31	71·57	2·56
Groundnuts ..	212·07	1060·52		19·99		16·17
Raw cotton ..	151·53	296·55	4517·38	51·07	3·35	11·55
Cotton manufactures ..	119·28	162·24	378·43	73·55	31·52	9·01

TRADE IN HIDES AND SKINS

Though the tanning industry occupies an important place in the economy of South India, the country's requirements and consumption of leather are very small. People are not much accustomed to the use of leather goods. The result is the leather industry has not developed and the bulk of the produce is exported to foreign countries either in raw or tanned state. Raw hides for export are either dry salted or air dried and arsenicated.

Though the tanning of hides and skins is carried on throughout the whole of India, on a small scale to satisfy local requirements, the export tanning industry is mainly in South India. Madras is the collecting centre, shipping 60% of India's exports to foreign countries.

Hides and skins (raw and tanned) forms the bulk of the exports passing through the port which taking the figures of 1936-37 amount to Rs. 708·38 lakhs or 54% of the exports to foreign countries. Practically the whole of the exports of the Presidency in raw and tanned hides and skins, passes through the Madras port, which is probably due to the efficient organisation of the merchants of Madras for marketing purposes. Raw hides and skins passing

through the port are of the value of Rs. 33·6 lakhs as against Rs. 34·5 lakhs of the Presidency and tanned goods, Rs. 674·8 lakhs out of Rs. 675·22 lakhs of the Presidency. These figures also show that about 96% of the exports of hides and skins is in the tanned condition, and that only about 4% passes out in the raw state.

The trade is mostly in the hands of Muhammadans as the Hindus still look on it with aversion.

Nearly all the sheep skins are tanned before export. The export of untanned sheep skins is of the value of Rs. 0·24 lakhs, negligible in comparison with that of tanned skins worth Rs. 157·4 lakhs. On the contrary Rs. 20 lakhs value of raw goat skins are exported as against Rs. 175 lakhs value of tanned goat skins. Nearly 10% of the exports of goat skins thus passes in the raw state. This is because goat-skins are able to stand for a long time in the untanned condition till they are tanned in foreign countries, unlike sheep skins.

The finest qualities of tanned sheep and goat skins come from Trichinopoly and the Dindigul sub-division of the Madura district, where there are expert tanners. The finest qualities of the Madras tanned skins are specially suitable for the production of light-weight leathers finished in light colours. In other parts of the Presidency and in Hyderabad there is a large outturn of tanned skins but they are of the ordinary variety.[1]

The essential tanning materials are avaram bark, (otherwise known as the Tanner's cassia) myrobalams and wattle bark. 'The avaram bark comes from a shrub growing extensively on dry stony hills and black soils of the Deccan. The bark of this shrub gives a buff-coloured leather, much liked by the curriers for manufacture of morocco leather used for book binding, furniture, and carriage-lining and many other purposes.' 'Myrobalams are the dried fruit of a tree of the deciduous type found abundantly in the hills of the Deccan and South India. The liquor prepared from it is not only a powerful tan, but imparts a bright colour to the leather and hence is highly esteemed for mixing with the tanning agents.'[4] Wattle bark is imported from South Africa for the industry, to supplement the local avaram bark. It is intended to plant wattle in the Nilgiris and make South India self-continued.

There is a net work of tanneries about 500 in number spread all over the Presidency, and tanning forms one of the foremost minor industries of South India. There are several delicate,

laborious and costly processes that are involved in the tanning viz., the processes of liming, unhairing, fleshing, deliming, scudding, treating in avaram bark myrobalams and pungam oil, stretching, tuffing etc.[5]

Let us now consider the direction of the trade. The United Kingdom receives over 90% of the total exports. The remainder goes chiefly to Japan, and U.S.A., while Australia, too, takes raw goat-skins from India. The bulk of the tanned hides and skins goes mainly to England from where a major portion is redistributed to other contries. In the case of raw exports, 50% goes to the United Kingdom. The figures show that, while the export is substantially of tanned hides and skins, there is still a considerable volume of export of raw hides and skins, not to mention the quantity of raw hides and skins exported from Northern India direct.

By the tariff of U.S.A. imposing 15% duty on tanned goods (1930), the Madras tanner is placed under a handicap. The export duty levied at 15% (with Empire rebate) worked from 1919 to 1923, when it was altered to 5% and finally withdrawn (1934-35). Since the world cannot do without the Indian article, it would be highly beneficial to the country, if this world commodity were exported finished. That, however, requires efficient modern methods of treating and (chemical) research ; and perhaps, a protective duty out of which also such research may be carried out. But neither the wealthy merchants nor the Government would do the needful. Such being the case, while geography places those raw materials in Indian hands, there is no utilisation of them to full advantage by man.

There is not much prospect of any substantial portion of skins and hides being consumed within the country and all the commodity has to be exported ; so that Madras will continue to have a good share of the export trade in it, in whatever condition it is exported.

TRADE IN GROUNDNUTS

Groundnuts coming long after leather and hides form 16% of the exports to foreign countries in 1936-37. It becomes very important also when we realise that in 1934-35 a fourth of the world's exports of groundnuts came from the Madras Presidency, a third of which was contributed by the Madras port alone.

This has been the normal share of the port in the Presidency's trade in groundnuts, but it suddenly fell to a fifth in 1936-37, while

the Presidency's exports have been almost doubled, and while the volume that passed through the Port received its normal increase. This is because the other ports of the Presidency, particularly Masulipatam, have increased their exports enormously. Till now the Madras port has been the principal port of the Madras Presidency for groundnuts, Cuddalore coming second long after it. But last year, Masulipatam has outstripped Madras, exporting 157,661 tons of nuts, or 28,635 tons more than the Madras port. It is becoming the outlet for the Districts of Kistna and Guntur where the increase in the acreage and yield in groundnuts are very conspicuous. The yields for 1936-37 in those Districts are 112,000 tons and 161,000 tons respectively as compared with the normal yield of 48,700 and 125,000 tons. The ports that come next after Madras and Masulipatam are Cuddalore, Cocanada, Negapatam and Bimlipatam. Pondicherry, where both the great firms of exports have their offices, is a very big exporting centre.

In the Map of export hinterland, stations sending groundnuts to Madras Port are found abundantly on the M.S.M. line crossing the Districts of North Arcot, Chittoor, Cuddapah and Ananthapur which are the regions of heavy production. Though South Arcot has a heavy production second in South India only to that of Kurnool, it does not send any considerable amount to Madras Port, but sends instead to Cuddalore, Negapatam, and Pondicherry.

Let us now consider the destination of the groundnuts of this port. Almost the whole of the commodity goes to the West European countries France, Germany, Netherlands, United Kingdom, Belgium, Denmark and Italy. Till the end of the official year 1933-34, France was the greatest buyer of the groudnuts exported from Madras port, but the three later years following that year has shown an excess of exports to the Netherlands over France. In the year 1936-37, Netherlands took almost 1½ times that of France.

For the export through the Madras port, groundnuts are grown in the red soil country of south-east Deccan. In this region the crop is sown at the beginning of summer, and the rainfall gradually rises to a late summer maximum as the crop is flowering. It is at this time that it needs most rain.. After flowering the seed ripens with a diminishing rainfall, and the crop is harvested in dry weather after the rains are over ;[6] it comes into the market between December and April as seen from the statistics of the monthly arrivals of nuts in 1937 in tons by rail at the port terminals.

January	.. 45,878
February	.. 13,626
March	.. 15,405
April	.. 13,170
May	.. 2,385
June	.. 2,718
July	.. 5,092
August	.. 2,362
September	.. 2,057
October	.. 4,150
November	.. 4,018
December	.. 14,695
Total	.. 1,25,556

The groundnut enters the market in December and the arrival is heaviest in January and then continues at a third of that maximum level till April, after which there is a marked decline. In this connection, we may note that the groundnut accounts for about half the railway inward traffic of the port terminals. In 1937, out of 2,55,547 tons of railway inward traffic, groundnut accounts for 1,25,556 tons.

A small quantity of oil and cake also are exported as noted below.

The export of groundnut oil and cake in 1936-37 is as follows:— Groundnut oil (80, 921 Gallons).

	Lakhs of rupees
Straits Settlements	.. 0·69
F.M.S. (Federated Malay States)	.. 0·53
Total of oil	.. 1·22

GROUNDNUT CAKE:—(5672 tons)

United Kingdom	.. 2·74
Germany	.. 0·62
Belgium	.. 0·15
Sweden	.. 0·14
Total of cake	.. 3·65

Thus the market for the cake is the West European countries and for the oil the East, where there is a large number of Indian immigrant population.

The importance and extension of groundnut is due to the fact that it is a prolific three-month-crop, growing on light sandy or red soils under monsoon rains, and requiring little irrigation water, along with least effort at cultivation. It has a double value, as a food-crop in the internal markets furnishing edible oils and as a cash-crop in the external; while the refuse makes good manure and cattle food. As the unexported quantities are readily absorbed in the local market when prices have fallen, the cultivation receives little set-back from drops in prices. There is therefore a steadiness about it. Of oilseeds of India, it holds a most commanding place, accordingly. The chief uses of groundnuts abroad are for oil, for edible oils, for soap making and for lubricant. It is also much employed by perfumers. It is used as a substitute for olive oil, in cookery, and in the manufacture of butter substitutes, confectionery, etc. The refuse is also fully used up.

Here is an opportunity which geography provides by way of seeds but man in India has denied himself their full and best utilisation.

RAW COTTON EXPORTS

Madras port exports 49% or about half the quantity of raw cotton exported from the Presidency. Japan is by far the largest buyer taking more than half the quantity shipped. Excepting a small amount exported to Ceylon, the whole of the remainder goes to European Countries of which Belgium receives more than half the amount.

The position of Madras as an exporter of raw cotton among other major ports is seen from the following table:—

	Exports of raw cotton in tons in 1936-37.
Bombay	.. 3,84,626
Karachi	.. 2,95,684
Calcutta	.. 10,086
Madras	.. 24,475

The M. S. M. Ry. handles almost the whole of the cotton to Madras Port. In 1937, excepting a small amount of 756 tons from Tiruppur in Coimbatore District coming by the S.I.R., the rest amounting to 20,225 tons came by the M. S. M. Ry. from the Districts of the Madras Deccan and Southwestern Hyderabad, and the northern Coromandel coast.

Cotton reaches the market in the earlier half of the Calendar Year and the heaviest arrivals at the port are in the months of April and May as seen from the following figures in 1937 for the arrivals of raw cotton at the harbour.

		Tons.
January	..	1,236
February	..	1,981
March	..	2,488
April	..	4,389
May	..	3,922
June	..	3,073
July	..	2,024
August	..	1,179
September	..	248
October	..	158
November	..	186
December	..	97
Total	..	20,981

Thus cotton arrivals are heaviest in the second quarter of the year. We have noted already that the groundnut arrivals are heaviest in the first quarter of the year. The combined effect is that the railway traffic is heaviest in the earlier half of the year and then gradually diminishes till November, and then begins to rise in December for the next year as shown by the following figures :—

		Tons.
January	..	59,552
February	..	23,565
March	..	26,234
April	..	28,229
May	..	14,798
June	..	15,559
July	..	17,116
August	..	11,160
September	..	11,785
October	..	11,797
November	..	11,354
December	..	23,798
Total	..	2,55,547

COTTON MANUFACTURES

In the whole of India, the export of cotton manufactures represent yearly 7% of the total output of the mills. 53% of the total trade in 1934-35 was from Bombay and 46% from Madras Presidency.[1] Of the Presidency's exports of the value of Rs. 162·24 lakhs in 1936-37 Madras port accounts for Rs.. 119·28 lakhs or about three fourths of that amount, whereas its share in the raw cotton exports of the Presidency is only one half.

The chief markets for the cotton manufactures exported are those colonies in which there is considerable Indian immigration. The exports go almost wholly to the tropical countries. Even the handloom woven handkerchiefs shown as being received by the United Kingdom have their ultimate destination in Africa. These so-called Handkerchiefs are made with 40s to 60 s in pieces of 8 Yds. by 3 feet.[1] Madras is the name of this large sized handkerchief. The coloured lungies and saries go mainly to Ceylon and Straits Settlements, where there is a considerable Indian immigration. The distribution of exports in Lakhs of rupees for 1936-37 is as follows:—

Country to which exported.	Handkerchiefs and Shawls.	Piece Goods coloured (Lungies & Saries).	Other Manufactures.	Total of Cotton Manufacture.
Ceylon ..	..	45·49	0·32	45·81
Nigeria ..	24·86	0·06	..	24·93
Straits Settlements ..	..	21·05	0·15	21·20
United Kingdom. ..	15·56	0·29	..	15·85
Sierra Leone ..	3·99	0·07	..	4·06
Federated Malay States ..	..	1·86	..	1·86
Other Countries ..	0·35	5·16	..	5·57
Total ..	44·76	73·98	0·47	119·28

MINOR EXPORT COMMODITIES

Tobacco.—Among the minor commodities of export, tobacco occupies the highest place. The export trade of Madras in tobacco consists of Rs. 20·15 lakhs, while that of the Presidency as a whole is 68·17 lakhs and that of All-India is Rs. 92·5 lakhs. The Madras export thus forms 29·31% of the export for the Presidency and 21·79 of the exports of entire India. It forms however only 1·5

per cent of the entire volume of export trade of Madras Port. The volume of trade in the commodity is steadily dwindling of recent years. The main external market for the tobacco is the United Kingdom which takes 89·4 per cent of the total quantity shipped; 5·26 million pounds of tobacco of the value of Rs. 20·08 lakhs are exported in an unmanufactured condition, the remaining 0·07 lakhs alone being sent out manufactured as beedies and cigars (Gudiyattam beedies and Dindigul Cigars) to Ceylon and Federated Malay States. A point to be noted about this trade is that while the percentage in weight of Madras export of unmanufactured tobacco to that of the export for whole India is only 18·5% (i.e., 5·26 m.lbs. to 28·5 m.lbs) the percentage in value is 22·7% (i.e., Rs. 20 lakhs to 88 lakhs). This shows that the Madras tobacco has relatively a higher value.

Though the tobacco export is not considerable, tobacco cultivation occupies a prominent place among the commercial crops of the Presidency. The average acreage for the past decade 1935-36 in the Presidency was 261,000 acres as compared to 1,350, 000 acres for the whole of India, i.e., about 19 per cent of All-India. The export trade of the Presidency bears much higher proportion than the acreage as we have already seen, but this only shows that consumption is higher in Northern India than in South India. Another factor which accounts for the larger percentage of Madras exports is the fact that out of the several varieties of tobaccoo produced, the Virginian variety otherwise known as cigarette tobacco, which is preferred in the United Kingdom, is produced only in this Presidency, especially in Guntur District thanks to the enterprise of The Imperial Tobacco Co. It has been recently introduced with great success in Kistna and Godavari Districts. A good portion of these is shipped from Cocanada and Masulipatam Ports, which accounts for the exports of Madras Port being only 29·31 of the exports of the Presidency. Formerly there was a good export trade in manufactured cigars to England, but that has completely dwindled on account of the import duty imposed in England. As regards the manufacture of Cigarettes for local consumption, the premier manufacturers of England have established their branches in India, making their own brands here using largely Guntur Tobacco. Thus, cigarettes that we get as English are often the manufactures in India by the foreign concerns. There are now a number of Cigarette factories in the Presidency. This accounts for the decline in the import of foreign cigarette, the import of manufactured tobacco being only 1·3 lakhs in the Madras Port. Another feature

is that 18·5 lakhs value of unmanufactured tobacco is imported as against only 1·3 lakhs of manufactured tobacco. A small portion of the unmanufactured tobacco is represented by the fine leaves of Sumatra, Borneo, Havana, etc., imported for being used as wrapper for cigars which are manufactured in Dindigul. The rest comes from the United States of America, i.e., from Virginia, for manufacture of Cigarettes. There are several other varieties of tobacco grown in the Presidency in large quantities such as the cheroot and cigar type, chewing tobacco, snuff tobacco and country tobacco for beedies, pipes etc., but they do not count for export or import trade, as they are all consumed in the Presidency itself. Some quantity is also supplied by Bombay and Mysore Provinces for the beedies trade.

Mica.—The export of Mica from Madras Port for 1936-37 amounts to 16,393 cwts valued at Rs. 11·077 lakhs out of India's total of 180·000 cwts. valued at 94 lakhs of rupees. This mica comes from the Nellore district of the Madras Presidency. The Mica mines in Nellore are situate on the eastern half of the Madras coastal plain over a tract of country about 60 miles long and 8 to 10 miles broad. Nellore mica is principally '*green*' mica and is shipped from Madras.

Though the distribution of the trade according to Custom House statistics would suggest that nearly 96% of the mica for the port goes to United Kingdom, there is a considerable re-export to Germany.[1]

Wool.—Export of wool in 1936-37 is of the value of Rs. 12·75 lakhs The wool exported from the Madras Port is the lowest of the three kinds into which the article is classified for trade purposes, (viz., merino, crossbreds, and carpet wool) and about 2/3 of the exports of wool is in the form of carpets and rugs. Even the remaining wool exported in raw state is destined for the manufacture of blankets ; rugs, carpets and felt only.[1] United Kingdom receives 3·65 lakhs value raw wool and United States 6·15 lakhs value of carpets and rugs.

Magnesite.—The magnesite for the export trade of the port comes from an area of about 4½ sq. miles in the Chalk Hills near Salem which is the principal area of occurrence in India.[1]

The magnesite exported from Madras Port in 1936-37 is of the value of Rs. 4,37,586. Of this export, the United Kingdom received Rs. 3·02 lakhs.

Wood.—Out of a total value of wood Rs. 4,32,530 exported from Madras Port in 1936-37, Sandalwood accounts for Rs. 400,112, out of which, Rs. 4 lakhs has gone to the U.S.A. and the remainder to Straits Settlements. The amount of the Sandalwood oil exported is 6407 gallons valued at Rs. 5,02,240 out of which Japan alone has received Rs. 4·37 lakhs value of the oil.

Sandalwood is practically limited to a restricted area in South India, chiefly Mysore and Coorg and the Coimbatore and Salem Districts of the Madras Presidency. The oil content of the wood varies from 5 to 7 per cent. This oil has valuable medicinal properties and is of considerable use in perfumery and in the manufacture of superior toilet soaps.[1] It is for these purposes that Japan receives more than 85% of oil exported from the Madras Port.

Fruits and Vegetables.—The exports of these for 1936-37 amount to Rs. 8,18,827 in value. Onions alone are of the value of Rs. 6·50 lakhs, while Onions exported from India in 1936-37 were of the value of Rs. 26 lakhs. Thus Madras Port accounts for a fourth of the onions exported from India to foreign countries. The onions are sent chiefly to Ceylon, Straits Settlements and Federated Malay States where it satisfies the demands of the immigrant Indian coolies.

The volume of trade in certain classes of goods is peculiarly susceptible to the general conditions at home in the hinterland. Such are Machinery and Millwork which show an increase now, due to the present expansion of mills and industrial enterprises in the Presidency. A saturation point may be reached when only repair articles may be in requisition. Also, economic causes may produce serious alterations as in cottons after Civil Disobedience of 1930. The Zanzibar Cloves Boycott, 1937-8, is an interesting example. At other Ports of India, the number of clove-bags dropped to a negligible point; Madras, which furtively broke the boycott, showed, on the other hand, corresponding rise

Further, the conditions of foreign trade are, in general, subject to violent fluctuations in conformity to the conditions abroad. Economic policies abroad have a profound effect upon trade in the commodities dealt in therewith; as, for example, in trade with Germany.

Again, as more and more of Indian Industrial Expansion takes place, Madras Presidency may take her goods from India and what passes now through the Madras Port as foreign goods may suffer diminution. Meanwhile, the Madras Port will maintain a steady pro-

gress and a stable one, too, in view of the nature of the goods that pass through it. In the foregoing survey, the coasting trade of the Port has not been included. Burma is hereafter to be treated as foreign. The Coasting Trade of Madras will be taken up in Part II.

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4. Commercial Products of India. By Sir George Watt.
5. Export Duty on Raw Skins and Hides.—Mr. Jamal Mahamed Sahib's letter to the Government of India (17th May 1929).
6. Agricultural Geography of the Deccan Plateau of India. By Miss E. Simpkins.

The Fifteenth International Geographical Congress, Amsterdam, 1938

The Fifteenth International Geographical Congress was held in Amsterdam from July 18th to 28th under the Presidency of Sir Charles Close, President of the International Union. H. M. Queen Wilhelmina honoured the Congress with her patronage, the Netherlands Government acted as hosts, and the Netherlands National Committee for Geography provided the efficient organisation. With an attendance of over a thousand members and with the ten-day period offering ample opportunities for the personal contacts, the Congress was a marked success. Social activities and short excursions were numerous and admirably conducted, while there were six longer excursions before and after the Congress to various parts of the Netherlands, and an opportunity of visiting Netherlands India in August. For each of these a scientific guide-book was presented.

Sir Charles Close pointed out in his opening Address that, although the various geographical societies throughout the world are responsible for the initiation of the International Geographical Congress, the Congresses themselves have now assumed such importance that they have taken on an official character and are largely sponsored by the governments concerned. He emphasized the expansion of geographical subjects since the First International Congress in 1871. Among the important considerations at that meeting were the establishment of an international date-line and the possible effect of the moon on the weather; problems of exploration formed a principal subject of the discussions. Now-a-days exploration as regards major discoveries of new lands no longer occupies a prominent place in the programme; in fact, there is no section devoted exclusively to exploration; geographers are mainly concerned with problems of distribution and land utilization.

Dr. Isaiah Bowman, President of the Fourteenth Congress, as chief delegate from the United States, pointed out the debt his country owed to all European countries in the development of its culture. In concluding his talk he emphasized the need for international co-operation and remarked that true co-operation required identity of purpose rather than standardisation of activity.

The business of the Congress was performed in the following ten sections:—Cartography, Physical Geography, Oceanography,

Human Geography, Economic Geography, Colonial Geography, Historical Geography and History of Geography, Geographical Landscape, Methodology and Education, and Biogeography.

The Section of Cartography was concerned with the uses of certain projections for specific purposes: the adaptation of surveying and cartographic methods to photogrammetric practice; the use of air photography in rapid cartography; and the presentation of new maps. In the papers and discussions there was exhibited a sharply contrasted opinion concerning the future of photogrammetry. Most continental Europeans looked upon it as the chief tool of map-makers; while the British Surveyors and Cartographers considered it as only an important auxiliary to conventional methods. A large part of this Section was devoted to the presentation of new maps, and many interesting experiments in the art of map symbolization were examined.

The Section of *Physical Geography* dealt with five questions, of which Pliocene and Pleistocene terraces, the mapping of erosion surfaces and glacial erosion are the more important ones. Prof. de Martonne presented a most ingenious morphological map of France that aroused much interest.

Three subjects were discussed in the Section on *Oceanography*: general oceanic circulation, internal waves, and the topography of the ocean floor. The activities of this section showed that this science is very much alive among the maritime nations, including Britain.

It is in the domain of *Human Geography* that the greatest developments have been seen in the post-war Congresses, and so numerous were the contributions at Amsterdam that they were divided among four sections.

One of these, named *Paysage Geographique* (Geographical Landscape) was concerned generally with the ideas underlying terms such as cultural landscape, rural structure, land utilisation, rural and national planning, and elicited a very varied group of papers.

Under *Economic Geography* three questions were dealt with; development of seaports; modes of transport; and "means of relating agricultural productivity to geographical factors," an important subject still evidently in the experimental stage of study.

To *Human Geography* so-called there were left three questions. Two of these dealt with the relationship of urban communities and were so clearly bound up with the paysage

subjects that the two were discussed at joint meetings. The third, the causes of migration movements, which treated both European and Asiatic examples, might well have taken some of the contributions to the next Section.

Colonial Geography drew large audiences and embraced aspects of colonisation and tropical colonies too numerous to be mentioned here. The following resolutions were passed as suggestions to the International Geographical Union: That the section on Colonial Geography be retained (although it is not a scientific name); that colonial governments be asked to promote the publication of topographic maps of their territories; that colonial governments be asked to include in their annual agricultural reports soil erosion and the measures taken to remedy it and to prevent it; that a commission be appointed to study the form of colonial census reports and meteorological publications relating to their colonies, and that they make specific suggestions for the form of treatment of questions relative to their regions."

In the Section of *Historical Geography and History of Geography*, papers of the first category were absent; though the historians of Cartography were as active as ever.

In the Section of Methodology and Education there were several interesting discussions on teaching methods, including one on the important aim of teaching children to understand and appreciate peoples of other lands. The success of this section was due largely to the preparatory work done by the (British) Geographical Association.

Four papers only were submitted to Section VII, *Biogeography*, of which three dealt with the present and past distributions of species in relation to the oldest geological periods, and one with the influence of Man on the natural vegetation of arid regions.

At the General Assembly of the International Geographical Union Prof. E. de Martonne (Paris), hitherto Secretary-General was elected to be President of the Union in succession to Sir Charles Close. It was decided to hold the next Assembly and Congress in 1942, the place of meeting to be determined later.

(Adapted from the *S. G. M.*, *G.J.* and *G.R.*)

Geography at the British Association

The Annual Meeting of the British Association for the Advancement of Science was held in Cambridge, where Proceedings in Section E (Geography) were opened by the President, Prof. Griffith Taylor on August 18th. His Address on "*Correlations and Culture: a study in technique,*" though spoken at some length, was distinguished for its breadth both of subject and treatment. The same day a symposium on the geographical aspects of the Scientific Delegation to India was contributed. Prof. A. G. Ogilvie discussed the Chota Nagpur Plateau, dealing with such matters as the relation of forests and agricultural land to surface relief. Prof. H. J. Fleure spoke on "the Aborigines of the Plateau." Mr. J. Macfarlane's subject was "Jamshedpur: an Indian Industrial Centre"; and Prof. C. B. Fawcett gave an account of South India, including its people and their occupations. Mr. R. H. Kinvig showed coloured and uncoloured films called "Bombay to Jamshedpur", which illustrated some of the papers.

An extensive lecture programme was based on the British Graham Land Expedition. Prof. F. Debenham spoke on 'The Geographical Laboratory', of which the new Department of Geography at Cambridge, in which the meetings of Section E were held, was itself the illustration.

Four papers of local interest and valuable by way of preparation for the excursions that followed; a symposium on 'English Ports and Estuaries in their Geographical Setting'; and another on 'Some Aspects of the Regional Concept'; a paper on 'The Classification of Communities by Occupations' by Dr. E. H. Selwood; a paper on 'The Growth of Inland and Seaside Resorts' by Mr. E. W. Gilbert; a paper on 'The Sidmouth Coast and the Preservation of its Scenery' by Dr. Vaughan Cornish; and 'Irrigation in the Canterbury Plains, New Zealand' by Miss W. F. Davies were among the other important items of interest in the E (Geography) Section. (Abridged from the S.G.M.).

Madras S. S. L. C, Course

DETAILED SYLLABUS FOR C GROUP GEOGRAPHY

Special Region for 1940 *and* 1941

AUSTRALIA (including NEW ZEALAND).

AUSTRALIA

I. *The Structure, Relief and Drainage.*

a. Australian Seas, Ridges and Islands.
b. Structural sub-divisions of Australia—Eastern Highlands. Barrier Reef, Western Plateau, Central Lowlands.
c. River-basins: Murray-Darling, Eastern coastal rivers, Coastal rivers draining north and west of the plateau, the Inland Basin, Rivers draining to the Gulf of Carpentaria.

II. *Vegetation and Animal Life.*

a. Distribution of Forest, Grassland and Desert.
b. Native flora peculiar to Australia.
c. Cattle and the Dairy Industry.
d. Sheep.
e. Animals peculiar to Australia.

III. *Climate.*

a. Rainfall: Distribution annually and seasonally.
b. Temperature.
c. Winds. Trade winds and westerlies. Monsoon.
d. Relation between Relief, Winds and Rainfall.

IV. *Water Supply.*

a. Artesian Basins.
b. Irrigation works.

V. *Distribution of Population.*

a. Relation between climate, water supply and mineral wealth in regard to distribution of population.
b. Situation of chief settlements.

VI. *History of Discovery and Exploration.*

The Dutch and English early discoveries.
Early settlement
Inland Exploration and beginning of sheep-farming.
Beginning of mining.

History of the political and economic development of the several States.
Relation between natural and political divisions.

VII. *Economic Development.*

A. Pastoral—Relative distribution and value of

a. Sheep.
b. Cattle (including dairy cattle).
c. Horses (Walers).

B. Agricultural. Relation between agricultural development and water supply.

In Temperate Australia—wheat, fruit.
In Tropical ,, —sugar, maize, tropical fruits.

C. Mining.
Distribution of the following minerals:—Gold, lead, Silver-tin, copper, coal.

D. Fisheries. Forestry. Manufactures.

VIII. *Trade of Australia.*

Relative value of internal and external trade. Relative value of trade with various countries. Raw materials, food stuffs and manufactured goods. Communications within and without the Continent.

IX. *New Guinea.*

NEW ZEALAND

I. *Location, Relief, Structure, Drainage.*
Volcanic area in North Island.
Southern Alps of South Island, Fjorded coast. Plains: relatively small area.

II. *Climate.*

Contrast with Australia. Example of maritime climate. Distribution of Rainfall.

III. *Vegetation.*
Distribution of Forest and Grassland. Peculiar flora: e.g., tree ferns. New Zealand Flax.

IV. *History of Exploration.*
Population and Settlement.

V. *Natural Divisions.*

VI. *Economic Development.*

A. Pastoral: Cattle in North Island, Sheep in South Island. Cf. Australian wool and dairy cattle of New Zeland. Mutton and beef.

B. Agricultural. Fruit farming.

C. Minerals: Gold, Coal, Kauri gum.

D. Water Power, actual and potential.

E. Tourist traffic.

Books suggested.

For Teachers' Reference:

Australia and New Zealand. Suggate (Oxford University Press).

Australia: Physiographic & Economic. Griffith Taylor, (Oxford University Press).

For class use:

A Geography of Australasia by Griffith Taylor (Oxford University Press).

Australasia by Leonard Brooks (University of London Press).

Select Articles of Geographical Importance from Recent Journals

The Geographical Journal: July 1938.

Discussion on the geographical Distribution of Industry—Opened by Prof. E. G. R. Taylor.

The Geographical Journal: September 1938.

Natural Resources of Palestine—By A. Bonne.

The Geographical Journal: October 1938.

International Geographical Congress: Amsterdam, 1938.
An Archaeological Journey in Western Iran—By Sir Aural Stein.

The Geographical Journal: November 1938.

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Peaks and Flowers of the Central Himalayas—By F. S. Smythe.

The Geographical Magazine: August 1938.

Spring Festival Among the Konyak Nagas of Assam—By Dr. Christoph von Furer-Haimendorf.
The Story of Tea—By Osbert Lancaster.

The Geographical Magazine: September 1938.

America on the Highway—By Elspeth Huxley.
Ancient Monuments of Mexico—By Rodney Gallop.

The Geographical Magazine: October 1938.

The Burma Scene—By Maurice Collis.

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The Anatomy of Exploration—By J. M. Scott.

The Geographical Review: April 1938.

Influence of Climate on the Cultivation of Citrus Fruits—By Edward A. Ackerman.
The Question of Colonies—By Prof. C. B. Fawcett.

The Geographical Review: October 1938.

Contrasts in African Farming: Aerial Views from Cape to Cairo—By Richard and Mary Upjohn Light.

Agricultural Regions of the North Italian Plain—By C. J. Robertson.

The Economic Regions of Germany—By Robert E. Dickinson.

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The Himalayan Journal: 1938

The Sourccs of the Sibansiri and Siyom—By F. Ludlow.

Across the Gangotri-Alaknanda Watershed—By J. A. K. Martyn.

The Kashmir Alps, 1937—By James Waller.

Geography: June 1938.

The Relations of Geology and Geography—By Alan G. Ogilvie.

The Biological Approach to the Study of the Cultural Landscape—By H. H. Swinnerton.

Town and Rural Planning: The Physical Factors in the Problem—By S. W. Wooldridge.

Present Land Use as a Basis for Planning—By E. C. Willatts.

Modern Factors of Industrial Location—By Elsic Yates.

Place-names and the History of Settlements in South-West Germany—By Alice F. A. Mutton.

Am Exchange Geograpny Teacher in New Zealand—By H. E. James.

Geography: September 1938.

The City of Durham—By G. Manley.

Labour Requirements in Plantation Agriculture—By R. Ogilvie Buchanan.

Local Studies—By Members of the Association's Standing Committee for Geography in Secondary Schools.

The Scottish Geographical Magazine: November 1938.

Pressure of Population and Misuse of Land in the Punjab—By R. Maclagan Gorrie.

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The Scottish Geographical Magazine: September 1938.

Correlations and Culture: A Study in Technique—By Prof. Griffith Taylor.

The Origin and Development of Dundee: A Study in Historical Geography—By S. G. E. Lythe.

International Geographical Congress at Amsterdam, 1938—By A. G. O.

Journal of Indian History: August 1938.

From Gujarat to Golconda—By W. H. Moreland.

News and Notes

This number of the Journal, which completes the thirteenth volume contains three more papers on South Kanara, read at the Mangalore Conference, but held over from the previous issue for want of space. The paper on *the Trade of Madras* was read at the Association on July 23. Mr. M. B. Pithawalla, who has specialised his studies on the Sind Region has contributed a paper for this issue on "Settlements in the Lower Indus Basin."

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A meeting of the Association was held on November 26, 1938 at the University Department of Geography, when Prof. K. C. Viraraghava Ayyar, M.A., L.T., delivered a lecture on "*A Peep at Kashmir,*" illustrated with views, under the Chairmanship of Mr. K. Narasimha Ayyar, B.A., B.L.

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A meeting of the Coimbatore Branch of the Association was held on November 1, 1938 in the Municipal High School, under the Presidency of Sri A. V. Venkatarama Iyer, M.A., L.T., when Sri R. Lakshminarasimhan, M.A., L.T., delivered an Address on "*A Geographical Survey of Modern Political Affairs.*"

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The Fifteenth International Geographical Congress was held at Amsterdam from July 18 to 28, 1938; and the Annual Meeting of *the British Association for the Advancement of Learning* was held at Cambridge, and Proceedings in Section E (Geography) began from August 18 and went on for about a week. A short account of each of these Conferences is given elsewhere.

* * * * * *

The Eighth South Indian Education Week was celebrated in Madras as well as in the various mofussil centres from October 31 to November 4. The central theme chosen for this year was "*Education for the India of To-morrow.*"

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The Fourth Annual Meeting of the Indian Academy of Sciences will be held from December 19 to 22, under the Presidency of Prof. Birbal Sahni, M.A., D.Sc., F.R.S. Among the interesting items in the Programme special mention may be made of a Public Lecture by the President on "*Separation of Burma as viewed by a Geologist*" and a symposium on "*The Planning of Power Production in India.*"

The Fourteenth All-India Educational Conference will be held at Bombay from December 27 to 30, under the Presidency of Diwan Bahadur Sir T. Vijiaraghavachari. *The New Education Fellowship, India* will have its Annual Meeting on the 30th, along with the Conference.

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The Twenty-Sixth Session of the Indian Science Congress will meet at Lahore from January 2 to 8, 1939. *The Geography and Geodesy Section* of it will be presided over by Mr. N. Subrahmanyam, M.A., L.T., F.R.G.S. Among the excursions arranged as part of the Programme are included one to Taxila and another to the Khewra Salt Mines.

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The Thirteenth Annual Meeting of the Madras Geographical Association will be held on February 17, 1939. *Members are earnestly requested to help in increasing the strength of the Association to the extent of each member getting in at least one other before the Annual Meeting.*

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The Ninth Geographical Conference of the Madras Geographical Association will be held in Madras about the middle of May, when papers on various aspects of the Geography of Madras and its Environs will be read and discussed. Persons intending to contribute papers for the Conference are requested to communicate to the Secretary at an early date the names of the topics which they intend to write about.

* * * * * *

The previous eight Conferences of the Association were held in various District Centres, wherein District Studies formed the chief feature. But the holding of the Conference in Madras next year is not a mere accident. It may be mentioned that the year is *the Tercentenary of Madras*, which will no doubt be celebrated in different ways by different bodies, with which also the Association will co-operate ; but it has been thought that the Association should also celebrate it its own way by holding its next Conference in Madras, and issuing a Madras Centenary number of its Journal.

Reviews

Kalaichchorkal. Published by the Madras Presidency Tamil Sangam. Price 1 Re. 4 as.

One of the main difficulties in the way of using the mother tongue in giving instruction in the non-language subjects in South Indian schools has been said to be the absence of appropriate vernacular equivalents for scientific and technical terms. There is no longer room for any such complaint at least so far as Tamil is concerned. The Madras Presidency Tamil Sangam has materially helped the cause of vernacularisation in the Tamilnad by the timely publication of this volume of Tamil Equivalents, which is fuller and more satisfactory than the departmental list on which it is based. The sections in the volume pertain to Mathematics, Physics, Chemistry, Botany, Zoology, Physiology & Hygiene, Geography, History etc., and Agriculture: and the work was done co-operatively by expert committees in each of the subjects. We are glad to state that the geographical portion of the work was carried out by a large representative committee of the Madras Geographical Association, which sat at it for several weeks. It is possible that there may be need for improvement here or revision there; but to have produced this useful volume is an achievement for which the credit is due to the enthusiastic band of workers in the Tamil Sangam and their collaborators. We join in the hope expressed in his Foreword to the volume by Sri C. Rajagopalachari, the Premier of Madras, himself the Chairman of the Physics Committee, that teachers in Tamilnad schools will make sincere attempt to familiarise the use of the terms suggested. It is also our strong hope that similar authoritative volumes will be forthcoming early enough in the other vernaculars of South India.

Some Old Sites in Sind. By M. B. Pithawalla (Karachi), 1938.

This paper, reprinted from the Journal of the Sind Historical Society—Vol. III, No. I, is a continuation of his Historical Geography of the region. An attempt has been made in it to identify some of the important old sites in Sind and locate them. These sites, 25 in number, are dealt with under four heads:— 1. Prehistoric ruins (3 places); 2. Those belonging to the Indus (Mihran) system (12 places); 3. Those belonging to the Hakra-Wahinda system (4 places); and 4. Deltaic ports (6 places). The

job is not an easy one owing to the fact that " the ever changing river-beds, lake levels, hill springs and river-mouths, all destroy sites and recreate them in no time in their new garbs and surroundings." But with his usual patience, Mr. Pithawalla, who has made the historico-geographical researches of Sind his own, has produced a well-documented and interesting paper in which he has attempted to relate the location of the sites with the physical geography of the region.

In concluding the paper, he remarks that " in spite of the presence of a great and classical river like the Indus or Mihran. There is not a single living city in the province, which can be called classical. Most of them are dead, and while dying have left only the legacy of a name or of bricks and pottery behind. Even Hyderabad, the erstwhile capital of Sind * * * is not two centuries old; while Karachi, once a fishing village but now an excellent harbour and the capital of autonomous Sind, will only celebrate its centenary in 1934."

Weath and Wealth of Sind. By M. B. Pithawalla (Karachi).

This is an address given at the International Club of Karachi, in which Mr. Pithawalla has dealt with the economic conditions and problems of post-Barrage Sind in proper geographic perspective, pointing out the potentialities of development of the natural resources of the region under the new conditions.

A Revision World Geography. (Longmans, Green & Co., Ltd, London), 1938. Price 2sh. 6d.

However theoretically one may decry examinations, they have to be accepted as a necessary evil. The book under review has been prepared frankly from the examination point of view by a Committee of experts in the subject with considerable experience in examining. In this volume they have tried to restrict themselves, therefore, to the essential facts of the main field of Modern Geography, which must first be understood before details can be appreciated. Quite interesting is the discipline which, they say, they have subjected themselves to in " writing this book without the use of works of reference on the grounds that what a group of teachers was unable to remember should not be expected from our pupils—needless to say, however, the facts have all been checked." They have further tested their conception of essentials by the questions set during the past 10 years by the

examining boards of the chief British Universities. A large selection of questions taken from those papers and a number of important maps and diagrams enhance the value of this "Revision World Geography," which gives a guarantee of minimum essentials to the examination candidate.

New Secondary School Geography, Parts I and II : (Tamil). By L. D. Stamp. (Longmans, Green & Co., Ltd.). Price as 14 and Re. 1 as 4.

The Southern Continents and North America : (Tamil). By Eva D. Birdseye. (Macmillan & Co., Ltd.). Price as. 12.

A Regional Geography of the World, Parts I and II : (Tamil). By N. Subrahmanyam. (The Indian Publishing House, Ltd.). Price as. 12 and Re. 1 as. 4.

Tamil editions of their Secondary School Geographies have been brought out by specialists, whose text-books of Geography in English are already well-known and widely used in South Indian Schools. In spite of individual variations in the matter of treatment and details, all the volumes under reference have been treated in a simple, clear and interesting manner with the right geographic perspective and with a good number of maps, diagrams and pictures. It is interesting to note how *real* demand has created the *right* supply ; and schools have now a good choice of suitable text-books in the mother-tongue. Simple Tamil equivalents of technical terms in Geography have been used in all these books, dispelling the flimsy objections and fears of people who have been saying that Geography cannot be learnt so well in the mother-tongue as in English for want of technical terms.

Eurasia and India : (English). By Eva D. Birdseye. (Macmillan & Co., Ltd.). Price Re. 1.

This book is the second in the series of text-books written to suit A-Group Syllabus of the Secondary School Leaving Certificate of the Madras Presidency. Eurasia is treated in outline in this volume and India in detail. A simple clear style and treatment, copious illustrations by way of maps, diagrams and pictures, suggestions for practical work with provision of statistical data, a bold print and neat get-up—are features that should commend a general use of the book in schools where English continues to be the medium of instruction.

The New Model Pictorial Atlas Geography of the Madras Presidency (Tamil). By C. S. Subbaratnam, (V. K. Arunachalam, Trichinopoly). Price as. 8.

The special feature of this book as indicated by its name is the representation of geographical facts by means of a series of appropriate maps, showing the various features and facts of geography. It is fully illustrated with pictures and diagrams; and questions and practical exercises are given at the end of each chapter.

Geography of the Madura District: (Tamil). By G. T. Williams and D. Ebenezer. (Madura). Price as. 6.

This book is written on the old systematic and administrative plan rather than on regional and descriptive lines. It is, however, written in very simple language, appealing to the experience of the children. Clear bold type, copious illustrations, provision of practical exercises and of outline maps for filling in—are some of its useful features.

New Model Kistna District Geography: (Telugu). By P. V. Subba Rao. (Venkatram & Co., Ellore). Price as. 4.

This is also another book written on old systematic and administrative lines, instead of on regional and descriptive lines. The logical approach from the solar system step by step to the District is quite unpsychological, and unreal to the children. But the volume is written in simple colloquial style, and is copiously illustrated with a number of fine pictures and several maps; and its get-up is excellent, being printed in bold type on glazed paper.

Books and Journals Received

Kalaichchorkal. By Madras Presidency Tamil Sangam.

Geography of the Madura District. By G. T. Williams.

Some Old Sites in Sind. By M. B. Pithawalla.

New Secondary School Geography: Parts I & II. By L. D. Stamp.

A Revision World Geography. By L. D. Stamp & others.

The Southern Continents & North America. By Eva D. Birdseye.

Eurasia & India. By Eva D. Birdseye.

New Model Kistna District Geography. By P. V. Subba Rao.

Regional Geography of the World: Parts I & II. By N. Subrahmanyam.

The New Model Pictorial Atlas Geography of the Madras Presidency. By C. S. Subbaratnam.

Wealth & Welfare of Sind. By M. B. Pithawalla.

The Geographical Journal: September, October, and November 1938.

The Indian Educator: September, October and November 1938.

The Geographical Magazine: October, November and December 1938.

The Quarterly Journal of the Mythic Society: October 1938.

Brahmavidya (The Adyar Bulletin): October and December 1938.

The South Indian Teacher: September, October and November 1938.

Southern India Commerce: July-August, September-October 1938.

Geography: September 1938.

Kalaimagal: October, and November 1938.

Educational India: October and November 1938.

Proceedings of the Royal Geographical Society of Australasia: South Australian Branch: 1936-1937.

The Scottish Geographical Magazine: September and November 1938.

The Educational Review: September, and October 1938.

The Geographical Review: October 1938.

Journal of Indian History: August 1938.

Ramakrishna Home & Schools: October 1938.

Journal of the Andhra Historical Research Society: January & April 1938.

Nagari Pracharini Patrika: Vol. 43, No. 1.

Elementary Education (Telugu): November 1938.

Visvabharathi Quarterly: November-January 1939.

Journal of the Annamalai University: October 1938.